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Railway Age

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Alphabetical Index to Advertisements, Page 78 Classified Directory of Advertisers, Page 74

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EDITORIAL

Railway Age

The Table of Contents Will Be Found on Page 5 of the Advertising Section

Will Traffic Make New Record?

There are indications that before winter comes the railways will make new records in the amount of freight business handled weekly and monthly. In June and July freight loadings averaged about 105,000 cars a week less than in the corresponding months of 1923. In August they averaged about 72,000 cars less than last year. In the week ended September 6, which included the Labor Day holiday, they were only 7,937 less than in the corresponding week of 1923. In the week ended September 13 they were 1,061,424, which slightly exceeded the figure for the corresponding week of last year. The trend of shipments of less-than-car-load merchandise and miscellaneous freight has been in the past a good indication of future developments. Their increase in 1922 proved to be a forerunner of the heavy freight business in 1923. Their decrease in the early part of this year proved to be a forerunner of the general decline of traffic. Within recent weeks shipments of these classes of commodities have been increasing and exceeding the shipments in the two previous record years 1920 and 1923. Grain shipments also have been exceeding all previous records. Coal shipments are not yet normal, but are increasing. In the week ended September 13, they were the largest since the first week in March, although still 1,800,000 tons less than in the corresponding week of 1923. The tendency of most classes of traffic is to increase and in view of the comparatively small shipments of coal that have been made thus far this year it seems highly probable that total freight shipments will continue to increase and that the freight handled by the railways in October will set a new record.

Consulting the Engineer

Except for the period of the war when the carriers were compelled to meet the requirements of a traffic that was unprecedented both as to volume and distribution, there has never been a time when the railroads were in greater need of increased capital expenditures. Never, also, has there been a keener appreciation by the managements of the responsibilities imposed on them in authorizing the necessary outlay for additions to the physical property. This arises not only from the difficulties which attend the financing but also from a realization that it requires the most careful study to guard against ill-advised expenditures. The extent to which it has been found necessary to analyze carefully the requirements which must be fulfilled by a large improvement project is illustrated by an article which appears on another page of this issue which describes the studies that were made preliminary to the general rehabilitation of the facilities for equipment conditioning on a certain railroad. The methods pursued in this case stand out in marked contrast to the rough and ready procedure of the past when the "judgment" of the "old man" was the fountain head from which all wisdow flowed. Those were the days when the engineer's part in the intensive development of railroads was purely that of the builder. He was not consulted as to the manner in which the improvement would meet the needs which led to its authorization. Today the engineering investigation is generally recognized as a foundation for executive action. But it enjoys this position only as it reflects the true facts founded on a knowledge of all phases of railway transportation involved in the particular project.

Improvements in Passenger Service

On several occasions in the past year or two the advisability of providing more attractive passenger service has been suggested in these columns. It is gratifying, therefore, to see that recent months have brought definite progress in this direction. Several roads have placed in service entire new trains built to special designs for use on particular schedules. Among these may be mentioned the Oriental Limited, the C. G. W.'s Rochester Limited and the Alton Limited. About all the individuality that many limited trains have had in recent years is their names. As far as equipment and service is concerned many—perhaps most—of them have been as alike as the proverbial two peas. It seems, however, entirely logical to assume that if a road wishes to impress a certain train on the minds of the public, individuality in equipment and service is needed in addition to individuality in name. The number of such trains which have been placed in service recently gives ample evidence that the railroads are coming to realize this fact. Indeed, at least two of them have gone so far as to paint the exterior of these trains a different color from that in use on their other cars and at least one has provided specially finished locomotives also. Moreover, notable acceleration in speed has been brought about in several important instances. Altogether it may safely be said that there has not been for many years such a period of interest and activity on the part of the railroads in catering to their passenger traffic as is being witnessed at the present time. It is to be hoped that the interest may not cease. Good passenger service, aside from the revenue it brings in, is good public relations work. Any departure the roads may see fit to make from the rather monotonous uniformity of appearance and service inherited from the period of federal control is certain to be welcome news to the public and to impress upon them that the railroads, like every other wide-awake business enterprise, are ever striving to improve their service, instead of being content to offer always a uniform, standardized, unchanging product.

Increase in Railway Stockholders

Another increase in the number of railroad stockholders is reported by the Interstate Commerce Commission in its preliminary abstract of statistics of Class I railroads for the year 1923 just issued. The number was 807,524, as compared with 777,132 in the year before, 752,967 in 1921 and 709,795 in 1920. Thus there has been an increase of about 12 per cent since the year in which a pronounced change in the government's policy of railroad regulation was made by the passage of the Transportation Act. The publication of these figures in this form was begun by the commission in 1920 but in 1919 it had published the results of a special study on the distribution of railroad security ownings which gave the number of stockholders of Class I roads, plus their non-

operating subsidiaries (which are not included in the later figures) as of December 31, 1917, as 627,930. The Bureau of Railway Economics had also published statistics as to the number of railroad stockholders beginning with the year 1915, covering operating and non-operating companies of all classes except switching and terminal companies, which showed a total of 626,122 for 1915, 612,880 for 1916, and 647,689 for 1917. Comparing the commission's latest figures with those for 1915 shows an increase in eight years of approximately 29 per cent. One of the most important phases of the railway problem at the present time is the question of how to make it possible for the railroads to accomplish a larger proportion of their financing through stock issues instead of by bonds bearing fixed charges. The amount of stock issued by Class I roads last year, according to the commission's report, was larger than it had been for several years, $280,525,341 as compared with $65,400,734 in 1922, $126,215,302 in 1921, and $35,275,617 in 1920, but the amount of funded debt issued, $811,349,833, was also larger than usual so that the proportion of stock to bonds was not materially changed. Also all of the $280,000,000 did not represent new capital as much of it was issued for conversion, consolidation, and stock dividend purposes. The number of stockholders for 1923 included 348,597 in the Eastern district, an increase of only 22 as compared with the year before; 81,296 in the Southern district, an increase of 6,597, and 377,631 in the Western district, an increase of 23,773. As the total stock of the Class I roads was $7,426,906,888 the average holding per stockholder was $9,197. Dividends were paid during the year to the amount of $346,544,448, which was at an average rate of 7.52 per cent on the dividend-yielding stock, which amounted to $4,607,897,472, but $2,819,009,416, or 38 per cent of the stock, paid no dividends.

A Cure for Radicalism

Uncertainty of employment is probably the greatest enemy of co-operation between employees and managements. The man who constantly has in his mind the fear of unemployment and the privations to which it may subject him naturally will not give the same support to movements for increased efficiency and more cordial industrial relationships as will the man, however modest his wage may be, who knows that he has at any rate a steady job. A feeling of insecurity and the despair which comes when fear of unemployment materializes in a lay-off or shut-down kindles the radicalism which the agitators fan into flame. A man out of a job through no fault of his own is not unlikely to feel that no form of industrial organization—socialism, communism, or what not—could deal more harshly with him than the existing form. Professor John R. Commons in writing on the subject of unemployment says: "America should take its lesson early. It might recognize that, while this credit system and liberty to get rich are the foundations of propertity and must be preserved at all hazards, yet, on the other hand, it is this very credit system, and this liberty to get rich by buying and selling that are the cause of the disastrous cycles of prosperity and depression of the past hundred years." Professor Commons then proceeds to present a most persuasive argument in favor of unemployment insurance, to which the employers should make substantial contributions as providing not only a payment in times of unemployment, but—what he considers more important—an economic incentive to management to do all it can to make employment constant, because, after all, it is employment and not insurance that the workers want. "It is important," he continues, "now that the willingness of labor . . . needs to be encouraged, that, having established security of investments as the foundation of our capitalistic system, we should establish security of job for the perpetuity of that system." An agreement for the establishment of unemployment insurance in the men's clothing industry in New York has been reached between the manufacturers and the union, in the expense of which the employers and employees share equally. A similar agreement is already in effect in other cities. Strangely enough the pressure for this agreement, which should tend to reduce radical activity, came largely from the union, which is ordinarily supposed to be socialistically, if not communistically, inclined. If capitalistic industry were made as attractive for the worker as it would be by the solution of the unemployment problem, there would be little to fear from the growth of radicalism. Political dissension does not thrive on general economic security and well-being.

Utilizing the Passengers' Time at Terminals

For the past year or two the New York Central has maintained a railroad exhibit on the mezzanine floor of Grand Central Terminal, New York. The central feature of the exhibit is the historic locomotive, the DeWitt Clinton, with its train of stage-coach cars, but in addition there are also many working models of locomotives, signals and other railway appliances, together with photographs, charts and diagrams which were displayed on the company's "Service-Progress Special." This exhibit at New York has attracted so many visitors—300,000 in five months—that the company has decided to enlarge and improve it and asks its officers and employees for suggestions. Has not the New York Central hit upon a highly effective method in interesting the public in railway problems and accomplishments? The record of the number of visitors would tend to show that it has—an average of 2,000 persons a day—few of whom, we think, can have failed to have experienced a decidedly favorable reaction toward the railroads in general and the New York Central in particular. Anyone who travels at all extensively is rarely fortunate enough always to avoid an occasional boresome wait of an hour or more at some large railway terminal. Such a person is inclined to welcome heartily any form of entertainment which may be afforded him. The Grand Central exhibit therefore doubtless satisfies a generally-experienced want on the part of the traveling public. Such an exhibit would probably be just as successful in any other large railroad terminal—perhaps more so in terminals where the intervals between trains are greater than at Grand Central. It is sheer waste for the railroads to fail to take advantage of the receptive frame of mind of persons whose time hangs heavily on their hands in terminal waiting rooms. Attention to the railroads' story, freely given under such circumstances, can generally be obtained only at great expense in other forms of reaching the public. This does not mean that such expense is not justified—it is many times over—yet when attention can be so easily and cheaply attracted, should the opportunity be allowed to slip? The New York Central is, to borrow a phrase from a well-known advertiser, "showing the way."

Who Should Pay the Commuter's Fare?

What should be the basis of the charges for commutation service? This is a question which, in spite of its importance, has never been answered in a manner generally acceptable to the public. The New York, New Haven & Hartford at the present time is endeavoring to secure a higher rate for this service in the New York area and, as a means to this end, is giving the public some of the facts pertinent thereto. These rates have been increased but 10 per cent in the last ten years in spite of the much greater increase in the general price

level and the rates at which other traffic is handled. During the same period travel at full rates in this area has increased only about 29 per cent, whereas that on monthly commutation tickets has increased 109 per cent and that on other reduced rate tickets 253 per cent. The proportion of passengers who pay full rates, the road maintains, has become too small to make up the deficits met in handling the passengers who ride at reduced rates. But why should one class of passengers be expected to pay for service to others? The road says that the cost per passenger handled at Grand Central Terminal alone is 19.2 cents, which is less than the income per trip on some commutation tickets. In other words, many passengers are not paying the full cost of terminal service to them, to say nothing of line haul. The suburban service offered by the New Haven is of a superior quality; electrified throughout, it brings its passengers to the heart of the city. Is such service worth more and is it entitled to higher rates than steam service which terminates outside the city, leaving the passengers to complete their journey by ferry or tube, or is it not? Certainly the passengers appreciate the difference in service, as witnessed by the much larger proportionate growth in population of the areas served by electrified roads reaching the heart of the city than in areas served by steam lines which do not enter the city. Even at that, we have not heard of any of the steam lines growing rich from their suburban service—quite the contrary, in fact. Are the lines which give a superior service, possible only because of heavy investments in it, entitled to a return on these investments or not? This is the question which the people must answer. If their answer is in the negative we do not see what adequate incentive can be held out to the roads which are not developed as intensively as the New Haven ever to improve their service. Railroad earnings are too meager to be sunk into unremunerative services. It is the duty of every railroad which is offering such service to put the facts fully, forcefully and constantly before the public, as the New Haven is doing.

More About the Decline of Railroad Mileage

THE MILEAGE of line of steam railways in United States has declined even more than previous estimates have indicated. The *Railway Age* published an editorial in its issue for May 3, page 1074, entitled: "Where Railway Mileage Has Declined" in which it was pointed out that the statistics of the Interstate Commerce Commission showed a decline in total mileage between June 30, 1916, and December 31, 1921, of 3,075 miles. It was added that information that had been gathered by the *Railway Age* indicated a decline of about 450 miles since the latter date, making an estimated total decline of 3,500 miles in the last eight years.

The complete statistics of the commission for the year ended December 31, 1922, which have just been issued shows that this estimate was substantially too low. The decline in mileage in 1922 alone proves to have been 763 miles. This makes a total decline from December 31, 1916, to December 31, 1922, of no less than 3,838 miles. It is probable there has been a further decline since then and that at present there are over 4,000 less miles of railway in the country than there were eight years ago. In other words, the decline in mileage within eight years has been about equal to a railroad from San Francisco to New York and from New York back to Chicago.

The following table shows the mileage in existence on June 30, 1916, and the way it had declined down to the end of 1922:

Date	Total mileage	Decline
June 30, 1916	254,251	...
Dec. 31, 1916	254,037	214
Dec. 31, 1917	253,626	411
Dec. 31, 1918	253,529	97
Dec. 31, 1919	253,152	377
Dec. 31, 1920	252,845	307
Dec. 31, 1921	251,176	1,669
Dec. 31, 1922	250,413	763

It will be noted that the largest decline took place in 1921 and amounted to 1,669 miles. Obviously, the reason for this is that in that year the percentage of net return earned by the railways was the smallest ever earned by them except during the war and the years immediately following when the net return was guaranteed by the government. The decline in the two years 1921 and 1922, in both of which the net return of the railways was extremely low, was 2,432 miles.

The following table shows the total mileage by states on June 30, 1916, and December 31, 1922, and the increase or decrease between these dates in each state:

RAILWAY MILEAGE BY STATES, DECEMBER 31, 1922, AND JUNE 30, 1916

	December 31 1922	June 30, 1916	Increase	Decrease
Alabama	5,354.16	5,495.75	.....	141.59
Arizona	2,452.48	2,410.39	42.09	.....
Arkansas	5,032.68	5,294.03	.....	261.35
California	8,282.09	8,440.58	.....	158.49
Colorado	5,170.09	5,701.59	.....	531.50
Connecticut	998.80	999.73	.....	.93
Delaware	335.39	335.13	.26	.....
Florida	5,283.58	5,279.98	3.60	.....
Georgia	7,192.63	7,482.24	.....	289.61
Idaho	2,877.54	2,872.57	4.97	.....
Illinois	12,029.79	12,141.92	.....	112.13
Indiana	7,197.48	7,475.53	.....	278.05
Iowa	9,837.62	9,946.44	.....	108.82
Kansas	9,384.60	9,344.85	39.75	.....
Kentucky	3,955.00	3,836.11	118.89	.....
Louisiana	5,065.42	5,603.12	.....	537.70
Maine	2,247.07	2,262.74	.....	15.67
Maryland	1,447.51	1,428.25	19.26	.....
Massachusetts	2,102.51	2,133.34	.....	30.83
Michigan	8,549.24	8,875.85	.....	326.61
Minnesota	8,811.72	9,152.59	.....	340.87
Mississippi	4,235.46	4,438.95	.....	203.49
Missouri	8,059.27	8,270.24	.....	210.97
Montana	5,039.63	4,847.88	191.75	.....
Nebraska	6,180.50	6,169.00	11.50	.....
Nevada	2,161.17	2,318.38	.....	157.21
New Hampshire	1,239.31	1,252.39	.....	13.08
New Jersey	2,313.81	2,337.53	.....	23.72
New Mexico	2,958.64	3,039.81	.....	81.17
New York	8,397.94	8,492.78	.....	94.84
North Carolina	5,382.35	5,537.44	.....	155.09
North Dakota	5,281.45	5,274.50	6.95	.....
Ohio	8,871.75	9,121.19	.....	249.44
Oklahoma	6,600.44	6,454.38	146.06	.....
Oregon	3,337.87	3,067.22	270.55	.....
Pennsylvania	11,426.67	11,634.71	.....	208.04
Rhode Island	210.69	203.09	7.60	.....
South Carolina	3,765.21	3,723.99	41.22	.....
South Dakota	4,276.31	4,278.90	.....	2.59
Tennessee	4,022.30	4,090.61	.....	68.31
Texas	16,150.62	15,866.84	283.78	.....
Utah	2,144.73	2,137.43	7.30	.....
Vermont	1,060.30	1,073.16	.....	12.86
Virginia	4,695.41	4,798.64	.....	103.23
Washington	5,479.39	5,698.32	.....	218.93
West Virginia	4,047.38	3,973.84	73.54	.....
Wisconsin	7,471.76	7,693.56	.....	221.80
Wyoming	1,958.65	1,906.24	52.41	.....
District of Columbia	36.42	36.87	.....	.45
Total	250,412.83	254,250.62	.....	3,837.79

Mileage increased in this period in 18 states. The largest increase was in Texas and was 284 miles. Oregon was second with an increase of 271 miles, and Montana third with an increase of 192 miles.

Mileage decreased in 30 states and the aggregate decrease in these states was 5,157 miles. The largest decrease was in Louisiana, where it was 538 miles, and Colorado was next with a decline of 531 miles. Other states in which the decline exceeded 200 miles were: Arkansas, 261 miles; Georgia, 290 miles; Indiana, 278 miles; Minnesota, 340 miles; Michigan, 327 miles; Mississippi 203 miles; Missouri, 211 miles; Ohio, 249 miles; Pennsylvania, 208 miles; Washington, 219 miles, and Wisconsin, 222 miles.

A study of these figures shows that it is impossible to attribute the decline of railway mileage to local causes. It has occurred in states in every section of the country. It has been largest in Louisiana, a southern state, with Colorado, a western state, a close second; Minnesota, another

western state, third; Michigan, which is more an eastern than a western state, fourth; Georgia, a southern state, fifth, and Indiana, an eastern state, sixth. The figures suggest only one conclusion and this is that it has been due to some cause that has been operating throughout the country. What this cause has been there can be little doubt. It has been the earning by the railways of inadequate net returns. This is the only cause that can be assigned, because it is the only one capable of producing the result which has operated throughout the country.

As a result of this reduction in railroad mileage many communities have been left without railroad service and many railway employees have been deprived of work. Of course, the lines that have succumbed first have been "weak" roads and unprofitable branches. If, however, success should attend the efforts of those who are advocating an even more restrictive policy of regulation, and especially of LaFollette and his followers, who are advocating a policy of railway valuation which would confiscate at least one-third of the value of the railroads, it would soon become necessary to scrap some large railways in every part of the country.

How much longer will the people of the United States continue to be influenced by men who favor a policy of regulation which, even when partially applied, has stopped the increase and caused a large decrease in the railway mileage of the country, and which, if made far more restrictive, as LaFollette and his followers advocate, would immediately destroy a much larger part of the mileage of the country and finally, of course, force all the railways into government ownership?

Stabilizing Railway Employment

THE EXECUTIVE COMMITTEE of the Association of Railway Executives has appointed a committee to confer with the Interstate Commerce Commission regarding a study of means whereby greater stability of employment upon the railways can be brought about.

This would indirectly involve a study of how the purchases made by the railways also may be stabilized. Railways buy materials and supplies chiefly for use in maintenance and improvement work. When they reduce the number of employees they necessarily reduce the amount of material and supplies they can use for these purposes and this results in a reduction of purchases. When they reduce or increase purchases they cause those from whom they buy material and supplies to reduce or increase the number of men employed in making materials and supplies. Directly and indirectly, therefore, a study of the stabilizing of employment on the railways involves a study also of the stabilization of railway purchases and the stabilization of employment in the industries that make railway materials and supplies.

These facts indicate the importance of the subject upon which the railways and the Interstate Commerce Commission are to confer. Its importance may be illustrated by statistics showing the great changes that have occurred within recent years in the number of men employed by the railways. The average number of men employed by the Class I roads in the year 1917 was 1,732,876. The average number employed in 1919 was 1,913,422. In February, 1920, the last month of government operation it was 1,970,525. In September, 1920, it reached the record figure of 2,197,824. Within the next eight months the number declined 654,108, or almost 30 per cent. Within the next six months it increased 211,420. Within the next four months it decreased 209,000, the result being that in February, 1922, the number of employees was 1,545,040. Nine months later, in November, 1922, in spite of the shop strike, the number of employees had become 1,820,463, an increase of more than 275,000 since February. In August, 1923, the number of employees was 1,973,505. It then began to decline and in June, 1924, was only 1,770,565, or about 203,000 less.

These great fluctuations in the number of employees are principally due to fluctuations in the volume of freight business. The classes of employees most affected are those in the transportation, maintenance of equipment and maintenance of way departments. The fluctuations in the number employed in the transportation department cannot be reduced as long as freight business continues to fluctuate as widely as it has in the past. Freight train service must be adjusted to freight business, and the number of men employed in yards and on trains must vary with the number of trains required to handle the available business. The fluctuations of employment in the maintenance departments also are indirectly due principally to fluctuations in business. It is well known, however, that the amount of maintenance work done and the number of men employed to do it fluctuate more than the changes in the volume of traffic warrant. A great deal of maintenance work which is really needed is deferred when traffic declines, with the result that it has to be made up when traffic increases, and the number of men employed in maintenance work varies accordingly.

It does not require much study to ascertain why maintenance work is deferred when traffic declines and is increased when it increases. In the absence of important changes in freight and passenger rates the volume of business determines the total earnings. These in turn determine how much cash the railways have available for maintenance work.

Those who, including the *Railway Age,* believe that every reasonable effort should be made to reduce the instability of railway employment and purchases, believe also it is desirable that the railways should spend more for maintenance in bad years and less in good years than they have in the past. It is, however, eminently proper and desirable that the railways should take this subject of stabilization of employment up with the Interstate Commerce Commission, because only a very superficial study of the facts is necessary to convince any reasoning mind that no substantial progress can be made in dealing with the subject without the co-operation of the Interstate Commerce Commission and other railway regulating authorities.

The following facts illustrate why this is true. In 1920 the total expenditures of the Class I railways for maintenance of way and maintenance of equipment amounted to $2,623,000,000. In 1921 and 1922 the total expenditures on both maintenance accounts averaged only $1,995,000,000 a year, or about 628 million dollars less than in 1920. The net operating income earned by the railways in 1921 and 1922 averaged only 686 million dollars a year. It necessarily follows that without the vast reductions in expenditures for maintenance made in these years the roads would have earned almost no net operating income, and in consequence almost every railway company in the United States would have been bankrupted. There can be no question that a vast amount of deferred maintenance accumulated in 1921 and 1922. It would, however, be futile and foolish to criticise most of the railway managers for the retrenchments in maintenance that they made. When the manager of a railway is confronted with the question whether he will retrench maintenance expenses to the limit of safety of operation or let the railway become bankrupt he will do the former, and nobody with any business sense would criticise him for it. Of course, when maintenance work is deferred it has to be done later. We see the effect of the deferring of maintenance in 1921 and 1922 in the statistics for 1923. In the last mentioned year total maintenance expenses were $2,296,000,000, or about 300 million dollars more than they averaged in 1921 and 1922. This increase was entirely due to more work being done and more materials applied since average wages were less than in the immediately preceding three years.

Let us suppose, now, that the railways had tried to do in 1921, 1922 and 1923 the exact amount of maintenance work that was needed to keep the properties in good condition, no more and no less. The result would have been that in 1921 and 1922 they would have earned much less net operating income than they did. They would not have received much popular sympathy at that time, because in spite of the bad financial showing they already were making there was a widespread clamor for reduction of rates to which the Interstate Commerce Commission yielded.

On the other hand, in 1923 they would have made smaller maintenance expenditures than they actually did and in consequence the net operating income earned would have been larger than it actually was. It might have exceeded, for all the railways in the country, the 5¾ per cent return on their valuation to which the commission has held they are entitled. There was also a clamor for reductions of rates in 1923. Could and would the commission have resisted that clamor if the railways as a whole in that year had been showing a net return exceeding 5¾ per cent?

The facts above presented bring out clearly the most important question that must be settled before any progress can be made in solving the problem of stabilizing railway employment and purchases. Under the accounting system prescribed by the commission and on the present basis of earnings and expenses if the railways should employ more men and do more maintenance work in poor years, and in consequence employ fewer men and do less maintenance work in good years, their net operating income would be reduced below the amount required to pay their fixed charges in bad years and increased in excess of 5¾ per cent upon their valuation in good years, and the average return earned by them, in both bad and good years, would be much less, as it has been heretofore, than the commission has held they are entitled to.

Now, while great fluctuations in the number of men employed are harmful, so would be the great increase in the fluctuations in the net operating income earned that would result from the adoption of this new policy.

Would the commission let the railways in years when earnings were comparatively good set aside reserves not charged to the operating expenses of these years to be used in bad years in doing more than the amount of maintenance work usually done in bad years? If, through any general change of policy, the net operating income shown as being earned in poor years were to be substantially reduced, and the amount of net operating income shown as being earned in good years were to be substantially increased, how would the owners of railway securities get their usual interest and dividends in poor years, and how would the rates of the railways and their net operating income be protected from unreasonable attacks in good years?

The fact is, there is a very close relationship between the question of stabilization of employment and that of how much net operating income the railways are allowed to earn. The statistics of the commission show that for a long period of years, except when the railways were under government control, the number of men employed and the net operating income earned have increased and declined together. They also show that ever since effective regulation was adopted the railways have been required to do business on a narrow margin of profit and that the general tendency has been for this margin to grow ever narrower. The ratio of total operating expenses to total earnings is much higher now than it was before the war. In consequence any given decline in total traffic and earnings makes necessary much more drastic retrenchments and reductions in the number of employees than it formerly did. The business depression in 1903 resulted in a reduction of only about 16,000 in the number of men employed by the railways. The panic of 1907 caused a reduction of 236,400 in the number of employees. The year 1914 was one of depression, but the number of employees was only about 100,000 less than in 1913. While the instability of employment within recent years has been due mainly to fluctuations of traffic, it has been greatly increased by the fact that the margin of profit on which the railways have been doing business has been relatively so narrow that only a comparatively small reduction of business has been required to compel severe retrenchments. The net return the railways may earn is within the control of the Interstate Commerce Commission and therefore the problem of stabilizing employment is largely one for the commission to solve.

Economy in Maintenance of Equipment Expenses

STATEMENT OF railway revenues and expenses and other statistics that have been reported recently month by month have supplied eloquent testimony that the mechanical department has once more put itself on something approaching an economical basis of operation. Charges to the maintenance of equipment account for the first six months of the year totaled $642,215,000, or 12.2 per cent less than for the first six months of 1923.

One of the features of railway operations in 1923 was large maintenance of equipment expense. The total of such expenses for the year was $1,474,891,000 or 17.1 per cent more than in 1922. The reason for the great increase in 1923 as compared with 1922 has generally been held to be the costs contingent upon catching up on the shopmen's strike in 1922. The amount of work done, which resulted in the increased costs, is indicated by the fact that on January 1, 1923, locomotives held for repairs requiring over 24 hours amounted to 21.1 per cent of the number on line, whereas at the end of the year the percentage was but 14.1.

The June, 1924, maintenance of equipment expenses were $99,173,000, or $25,300,000 less than in June, 1923. It was the smallest amount charged to this account for any month since the revival of business early in 1922, except for July, 1922, when cessation of work in the shops due to the strike reduced maintenance of equipment expenses to an inordinately low level.

The fact that maintenance of equipment expenses in June were so low may mean much, or it may mean little. It may mean merely that the railways have reduced their forces because of the decline in traffic or possibly even beyond what the decline in traffic would, in the minds of some people, justify—in other words, they may have "cut" equipment maintenance. It may, on the other hand, evidence economy of operation, although such might be difficult to prove from the figures alone. On the whole, however, the evidence is that the railways have finally overcome the conditions resulting from the 1922 shopmen's strike, both from the standpoint of having brought the condition of equipment back to normal, or better, and from that of having restored pre-strike efficiency, or better, in the shops.

When we compare the figures for 1924, which include little or no costs of catching up on a deferred maintenance condition (such as existed after the shop strike), with those of 1923, we should naturally expect to find the 1924 totals much more moderate. To railroad men these factors must seem most elementary. The surprising feature is that it has been so difficult to make others believe that the maintenance of equipment costs of 1923 were high because the railroad shops carried out during that year a most extensive program of equipment rehabilitation.

A ready index of the size of the June, 1924, figure of maintenance of equipment expenses is available in the form of the ratios of such expenses to total operating revenues. The ratio of maintenance of equipment expenses to total rail-

way operating revenues in June was 21.3, the lowest ratio for any month in a five-year period except July, 1922, when the shop strike was on and except for July, August, September and October, 1921, during most of which year admittedly maintenance of equipment was greatly neglected as a result of the extremely low earnings characterizing that period. In June, 1923, the ratio was 23.1 and for the year 1923 it was 23.2. The ratio for the first six months of 1924 was 22.4—not as low as in June, but low comparing with a ratio of 23.6 for the first six months of 1923.

In June, 1924, the ratio of maintenance of equipment expenses to total operating expenses was 27.2. There was no month in 1923 in which the ratio was as low as this; and only two months in 1922, namely July and August. There were several months in 1921 in which it was lower. The ratio of 27.2 in June, 1924, compared with 30.0 in June, 1923. For the year 1923 the ratio was 29.8. The ratio of 28.2 for the first six months of 1924 compared with 29.9 for the first six months of 1923.

These ratios indicate beyond question that there has been a substantial saving in maintenance of equipment expenses during recent months. Percentage ratios of this kind must, however, be used with discretion, principally because there are so many variable factors which enter into the percentage relationships. Fortunately, additional information is also available.

The cost of freight and passenger locomotive repairs for June, 1924, estimated from the Interstate Commerce Commission monthly report of freight and passenger train unit costs, was $29,900,000. This was the lowest figure to be reported since August, 1922. An average of the figures for the first six months of 1924 was $33,800,000. The manner in which locomotive repair costs were expanded in 1923 is indicated by the fact that the average of the twelve monthly figures for that year was no less than $39,200,000. In 1921 and in 1922 there was probably less money spent in many of the months for locomotive repairs than there should have been. The average monthly for 1922 was $31,000,000; and for 1921, $32,000,000. The year 1920 was characterized by its peak price level. The average monthly for that year was $41,500,000.

The cost of freight and passenger locomotive repairs in June, 1924—$29,900,000—compared with a figure for June last year of $40,200,000. It is noteworthy that whereas in June, 1924, as compared with June, 1923, there was a decrease of 20.3 per cent in total maintenance of equipment expenses, the decrease in the cost of freight and passenger locomotive repairs was over 25 per cent.

There is no question that much of the reduction in maintenance of equipment costs has been in labor. The number of employees in the mechanical and stores departments in June, 1924, was actually 10,802 less than it was in May, 1924, and 83,193 less than it was in June a year ago.

There is room for a reasonable belief that the reduction in maintenance of equipment expenses in general, or in the charges for repairs to freight and passenger locomotives in particular, in recent months has been due to the fact that less work has been done. This is indeed what the figures do develop but they also show that the reduction of activity in the shops could not possibly have been sufficient to explain entirely the reduction in expenses. Details of work done are available in the form of the figures of locomotives turned out of shop reported by the Car Service Division. They show that in June the number of classified repairs totaled 3,468, running repairs 47,221, and total repairs 50,689. These totals were less than the totals reported for March, April or May, but considerably in excess of the figures for January and February. In all five of these months the cost of locomotive repairs was greater than in June.

It is well to examine whether locomotive condition is being kept up. It apparently is. The number of locomotives awaiting classified repairs on March 1, for example, was 6,047 or 9.4 per cent; on June 1 it was 6,099 or 9.5 per cent, and on August 1, 6,073 or 9.4 per cent. On March 1, locomotives held for running repairs made up 8.1 per cent of the number on line, on June 1 only 7.4 per cent, and on August 1, 7.8 per cent. Furthermore, while there were 3,800 serviceable locomotives stored on March 1, there were 6,661 on June 1 and no less than 7,152 on August 1. There is little reason to complain about the condition in which the railroads have their locomotives at this time. The condition as to cars is not quite as satisfactory. The percentage of bad order cars on March 1 was 7.5; on June 1, 8.3 and on August 1, 8.9. The percentage of bad order cars usually rises when business falls off. Whether that means that maintenance is somewhat neglected or the railroads are less particular about what they call bad order cars when business is rushing has been difficult to ascertain.

The evidence is plain that the railroads have restored their maintenance of equipment expenses to more normal levels and that they are holding their expenses down without neglect of repair work that ought to receive current attention. The evidence is that 1923 maintenance costs were excessive due to the necessity of catching up on deferred work and to the expensiveness of operating the shops in many cases with new forces. The facts, as they become available from month to month, amply bear out the *Railway Age's* conclusions made last December, that 1923 maintenance of equipment expenses were unduly high and that reductions in them could be expected in 1924, with or without a decrease in traffic.

Books and Articles of Special Interest to Railroaders

(Compiled by Elizabeth Cullen, Reference Librarian, Bureau of Railway Economics, Washington, D. C.)

Books and Pamphlets

The Book of Daniel Drew, by Bouck White, New edition. 423 p. Pub. by G. H. Doran Co., New York City. $2.50.

Proceedings, 1923-24, of the Great Western Railway Lecture and Debating Society, London Branch. Contents include discussions of "common user of wagons," railway fares reform, work of an engineering division, lectures on travel and plant hunting in Eastern Tibet, London traffic problem, etc. Each paper separately paged. Illustrated. Pub. by the Society, London, England.

Railroad Securities, 1924. Railroad section of Moody's Analyses of Investments and Security Rating Books. 2052 p. Pub. by Moody's Investors' Service, New York City. $20.00.

Periodical Articles

The Attempt to Establish the Eight-Hour Day by International Action, by Herbert Feis. Part I. Work of International Labor Organization, and results secured in various countries. Political Science Quarterly, September, 1924, p. 373-413.

The Chinese Eastern Railway: Map and Note, by Frederick Deane. Terms of agreement as to operation between Soviet government and Peking government. Foreign Affairs, September 15, 1924, p. 147-152.

"I Think You Can and I Believe You Will," by Keene Sumner. Interview with President Baldwin of the Missouri Pacific. American Magazine, October, 1924, p. 16-17, 156-161.

Turning the Wheels of the Railroad. Descriptions of the "latest" in steam and electric locomotives and rail cars. Scientific American, October, 1924, front cover and p. 244.

Letters to the Editor

[The Railway Age *welcomes letters from its readers and especially those containing constructive suggestions for improvements in the railway field. Short letters—about 250 words—are particularly appreciated. The editors do not hold themselves responsible for facts or opinions expressed.]*

The Ideal Flagman

Denver, Colo.

To the Editor:

As everyone knows, rule 99 of the standard code of train rules, requiring the protection of delayed trains by red flag or lantern and torpedoes, is quite brief, the attempt to provide in the rule book complete reference to all of the varied conditions that may be encountered by a flagman, which formerly characterized this rule, having long since been given up. But the absence of details in the printed rule does not, of course, alter the fact that varied and complicated conditions exist, nor does it do away with the necessity that the flagman shall understand all kinds of conditions, and school himself properly to deal with them. He must be prepared to answer any or all questions or puzzles that the train-rule examiner may put to him. Different roads have different ideas and the question as to what is reasonably perfect flagging remains to be settled. I say reasonably perfect; the ideally perfect is universally known to be unattainable in everyday practice.

As embodying an interesting presentation of one phase of the flagman's duties the following paragraphs from a recent statement by H. W. Forman, assistant to the general manager of the Western Pacific, will be appreciated by the readers of the *Railway Age*. Mr. Forman, as the reader knows, is one of the most prominent train-rule examiners in the country.

Principles to be Observed in Carrying Out Rule 99, for the Protection of Passenger Trains:—Western Pacific Railroad

"Not a single foot of main track is exempt from the rule requiring flag protection.

"Should a stop of more than one minute be made at any station, the engineman must whistle for rear end protection. He must call in flagman at every stop, regardless of duration.

"If the train stops elsewhere than at a station, the rear end protection signal must be sounded immediately and flagman recalled before proceeding. Conductor is not permitted to start his train until it is known the flagman has returned to it.

"At momentary stops at stations (one minute) the flagman must go back 30 ft. from rear of train. If, upon starting, he is unable to reach the front end of last car, he is permitted to get on at the observation end.

"At points where flagmen change, the incoming man must remain at his post until relieved by the outgoing flagman.

"On subdivisions where there are tunnels, flagmen must keep a red and a white lantern burning during the day. (There are 43 tunnels between Salt Lake and San Francisco, this is why the Western Pacific is referred to sometimes as the 'honeymoon route.')

"Flagmen must not carry or signal with a red and a white lantern held in the same hand, as the white light obscures the red; nor may they give a proceed signal with a red flag.

"They are not allowed to leave the rear of their trains at terminals, not even to get lunch, nor may a flagman go to the diner enroute to eat unless relieved by the front trainman or the conductor.

"They must 'dog trot' in going out and returning to train.

"Flagmen are not allowed to wait until signalled by whistle to go back and flag, nor must they expect to be told. Under no circumstances may a flagman let a train pass him, when required to stop it, without giving the engineman too kinds of stop signals—visual and audible, not even though engineman acknowledges the stop signal and shuts off before reaching him. The only fusees used are red ones, burning ten minutes.

"When necessary (in the night) to use a lantern to kill a rattlesnake, the white lantern is recommended—to make use of the red one might result in its being extinguished. This is no joke; there are all kinds and sizes of rattlers on the desert from sidewinders to diamond-head. They have all the way from eight to twenty rattles, not counting the button."

So much for what may be called the preliminary features of the flagman's duties. The serious matters of going the full necessary distance when pressed for time, and when the next following train is known to be far away, and of deciding whether a warning a half-mile back is necessary at all, are not here dealt with. I have, however, felt justified in using title "The Ideal Flagman," for a man who is thoroughly imbued with the importance of carrying out these rules will have gone a good distance on the road to that conscientious appreciation of the rule that leads him to do his best at all times; to have a vivid idea of safety first in spite of laziness or other kinds of reluctance.

To what extent do the trainmasters of America find it practicable to keep all of their passenger flagmen (and conductors) keyed up to this high standard? Some letters on this point in the *Railway Age* ought to do much good.

M. W. E.

Does Heavier Rail Justify Fewer Ties?

Bethlehem, Pa.

To the Editor:

An editorial on page 356 of the *Railway Age* of August 30, 1924, entitled "Justification for Heavier Rail on Branch Lines," quite definitely recommended that the number of ties in branch tracks should be reduced to offset the greater strength of the heavier rail and in that way reduce operation expenses. This is so absolutely at variance with our ideas that I have felt compelled to give you my views.

The Lehigh Valley can be credited with being a pioneer in the use of very heavy rail sections; its 136-lb. rail section was designed in 1915 and first laid in 1916, over eight years ago. The 100-lb. rail removed from the main line has been laid in its branches. When we get out of trouble on our branches by using stronger rail and improving the tie conditions, why should we try to get back to the old conditions by taking out some of the ties? Why did we lay the heavier rails on the branch lines if we were satisfied with the branches as they were? A reduction of operating expenses is what we all want to accomplish and in our opinion the way to do that is to *improve* the track, not *undermine* it.

The results obtained on the Lehigh Valley in the reduction of maintenance of way expenses, while at the same time improving the property, is probably fairly well known through the various articles published. I have been frequently asked to explain how we have reduced our tie renewals to the low average per mile therein outlined and I will repeat here some of the prime reasons for it.

First—Since 1910 we have creosoted as high a percentage of the ties used as conditions in regard to the supply of creosote oil and percentage of tie renewals would permit. About 70 per cent of the ties now in the track have been creosoted.

Second—We began in 1910 to insert *additional* ties in renewals. We use 20 ties to the 33-ft. rail in our heavy traffic track. These ties are 7 in. by 9 in. by 8 ft. 6 in. and this gives us 45 per cent of the rail bearing on ties. In branches we use 6 in. by 8 in. by 8 ft. ties proportioning the number of ties to the amount of the traffic handled. In no case does this decrease the number of ties in the track.

Third—We use a heavy tie plate eight inches wide.

Fourth—We use 136-lb. rail on heavy traffic tracks and the 100-lb. rail released from the heavy traffic tracks on branches.

The heavy rails have had a great deal to do with reducing tie renewals. The load upon the individual tie has been relieved by the heavy rail distributing the load over more ties and by the presence of more ties in the track to receive the load. Immediately after laying the heavy rail on branches, our tie renewals on those branches decreased. The way to save money on a branch in our opinion is first to get the branch up in as good a condition as its importance warrants, make it strong with heavy rail, ballast and enough ties and then hold the labor force down to the requirements under the improved conditions.

Notwithstanding the fact that we have used the heaviest rail for many years and have increased the number of ties in the tracks, our annual purchase of new rail *in tons* is less than it was before we began using the 136-lb. rail and our tie renewals are well under 100 to the mile; our rails and tracks are in a condition far superior to that of former years and our ties are *sound*. Our experience has shown that the use of heavy rails reduces rail purchases and that heavy rail and a sufficient number of ties in the track help to reduce tie renewals.

G. L. MOORE,
Engineer Maintenance of Way, Lehigh Valley.

La Follette, Jr., and the Canadian Roads

NEW YORK.

TO THE EDITOR:

"Young Bob" LaFollette has been giving expression to some misleading statements respecting the success of government ownership of railways in Canada. Among other things he says that between 1921 and 1924, Canada reduced her agricultural freight rates to pre-war levels. Then he follows this up with the following statement:

> And yet paying substantially the same wage scales to members of the same railroad unions, which we have in this country, the Canadian National Railways, owned by the Canadian government, has changed a deficit of $37,000,000 in 1921, when the system was taken over under Sir Henry Thornton's management, to a surplus of more than $20,000,000 in 1923.

It is true that the freight rates on the eastward movement of grain from the prairie provinces to the head of the Great Lakes have been reduced to the pre-war level. But it is not true that this was done as a result of the government owning many miles of railway. It was done because of a contract entered into with the privately-owned Canadian Pacific in 1897, the provisions of which with respect to rates were suspended between 1918 and the summer of 1922.

But "Young Bob" LaFollette does not tell the farmers that the government-owned railways did not favor the return of these rates. Indeed there was a well-grounded fear that the rates would injure the government railways. So if the government-owned railways had had their way, the rates would have remained where they were.

"Young Bob" is far from the truth in his statement of the financial showing made by the Canadian National. He says that in 1921 they had a deficit of $37,000,000. This was merely the deficit on 10,000 out of 22,500 miles of the system, or on the Canadian Northern portion. He left out $36,000,000, for the total deficit was $73,000,000. He is likewise misleading when he conveys the impression that a deficit of $37,000,000 was, within three years, converted into a surplus of $20,000,000. The $37,000,000 was the total deficit, including fixed charges, on 10,000 miles, while the $20,000,000 "surplus" was only the net operating income on the whole system, leaving out entirely the fixed charges. Instead of the government-owned railways of Canada making a profit of $20,000,000 last year, they actually had a deficit of $53,000,000 when fixed charges were paid.

ECONOMIST.

Forecasting and the Budget

NEW YORK.

TO THE EDITOR:

I have read with much interest the editorial entitled "Forecasting and the Budget" which appeared in the *Railway Age* of August 23.

On the whole I agree with the statements made in the article and especially those regarding the advisability of railroads giving more attention to ways and means of more accurately forecasting their immediate future traffic requirements.

It has been my observation that the principal fault with railway budgets is that they are changed every month or so to make them more nearly conform to actual expenditures, instead of a forecast of from three to six months in advance. Budgeting and forecasting should go together but the former, in my opinion, should be based on the latter.

Any forecast which may be mentioned has reference to something more definite than a mere "guess" as to what is likely to happen. Such a forecast is an estimate of the immediate future which is based on present conditions and past experiences, with due regard for long-time trend and seasonal influences. Neither of the latter will vary greatly within a short period of time.

The budget, in turn, should be based on a forecast determined in such a manner. No forecast, however, can possibly take into consideration non-economic factors such as strikes.

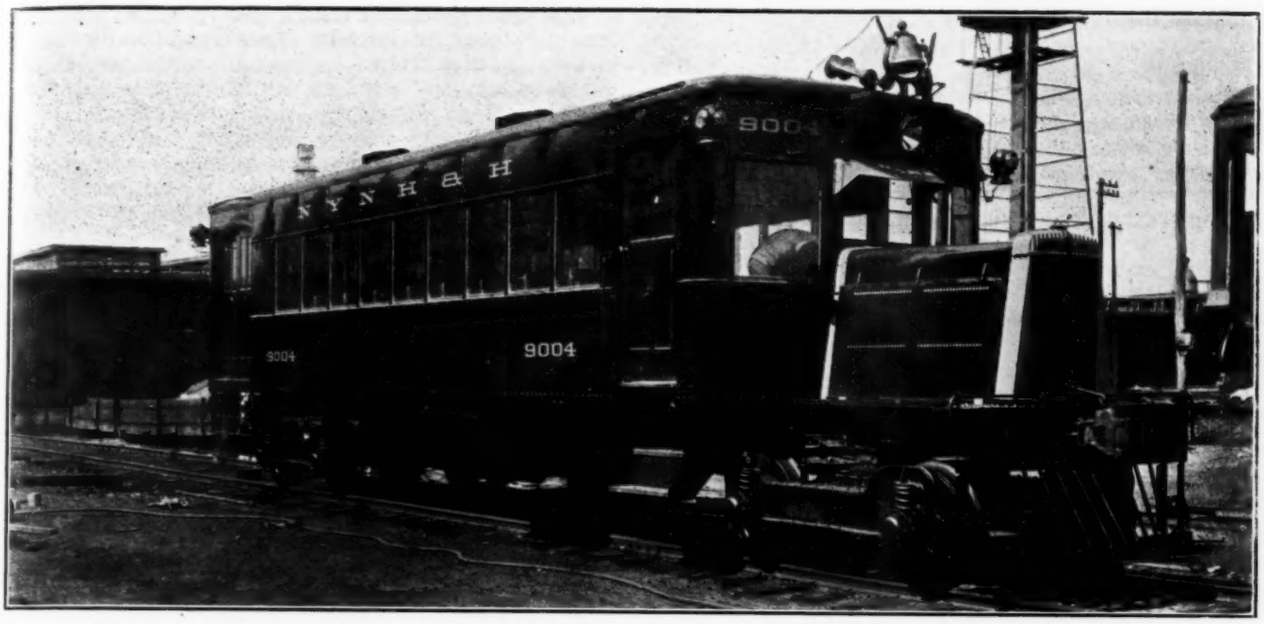
A study of Professor Vanderblue's article on "Railroad Traffic and the Business Cycle," which appeared in the *Railway Age*, will show that strikes would have interrupted any forecast that might have been made prior to their occurrence, but it will be noticed that the trend was not changed. Such, in my opinion, would be the case with any forecast made at the present time.

It will be extremely difficult to convince the management of any railroad that the proper time to prepare for future traffic requirements is when that road is experiencing low earnings or, quite possibly, actually operating in the "red." Past experience, unusual circumstances excepted, has shown this to be the case and there is every reason to believe that such will continue to hold true in the future.

I understand one railroad is making a study of the Harvard Economic Service method, with a view, possibly, of utilizing some of the methods advanced by Professor Vanderblue in his articles.

W. W. ZACHARY.

THE CHICAGO & ALTON has made preparations to take care of delegates to the Knights' Templar conclave in Springfield, Ill., September 25 and 27, who cannot secure hotel accommodations by laying a mile of track in the fair grounds on which 50 Pullman cars may be parked.



A Double End Motor Car Seating 55 Passengers with Seats Arranged for Two on One Side and Three on the Other

Design Factors of the Gasoline Rail Car*

Weight-Space and Weight-Power Ratios of Prime Importance—Transmission Systems Compared

By W. L. Bean
Assistant Mechanical Manager, New York, New Haven & Hartford

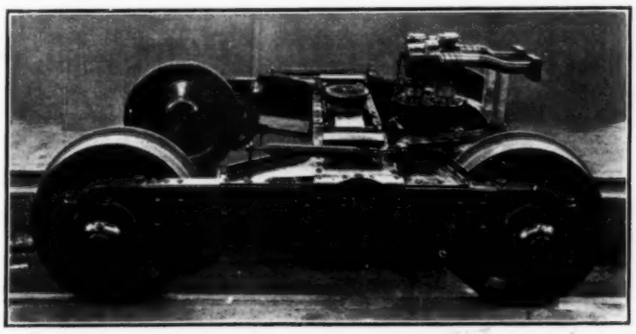
WHEN AN ENGINEERING officer of a railroad undertakes the selection or design of a unit rail-car, he must consider carefully the factors of size of car, speed, grades, curvature, power of engine, transmission and control system, gear-ratio, heating, lighting and seating arrangement, if he is to secure a satisfactory vehicle.

The size of the car should first be carefully determined. Because of the need for keeping the weight, and hence the power plant to the minimum, the space should be as small as practicable to meet the traffic requirements. The shortening of the car body with the placing of the engine under a hood, along conventional automotive lines, is good from a weight-space utilization standpoint. Bulkheads or partitions dividing the car into several compartments should be as few as possible, because they add weight and increase the awkwardness of passage through the necessarily narrow aisles and doorways.

The Engine and Its Horsepower

The engine, it is presumed, will use gasoline fuel since Diesel-type engines have not been produced and time-tried in light weights at horsepower ratings desired in passenger rail cars of the sizes under consideration. Except in very small cars, it may be assumed that few four-cylinder engines will be used, because the amount of power required is better supplied by six cylinders, with resultant quietness, smoothness and flexibility of operation. The use of two smaller engines on one car, with ensuing complications of control and regulation, weight, noise, vibration and the like, does not seem attractive.

In rail-car operation the brake horsepower demand for long periods of time in relation to the nominal rating of the engine is higher than in highway vehicle operation. The trend, as a result of experience, is toward larger power reserve. To maintain railroad passenger train schedules reliably throughout the varying seasons of the year means that dependable power must at all times be available. Furthermore, it is not economical to require a gasoline engine to work continuously at high points on the horsepower curve. Inasumch as they operate largely on branch lines, gasoline rail cars tie up at night or over Sunday at outlying points to which repair men must be deadheaded, usually with resulting low labor-utility efficiency; consequently, if engines are overloaded and frequent repairs are



Side View of the Motor Truck Which Forms Part of the Waterbury Hydraulic Transmission

*Abstract of paper presented before a joint meeting of the New York Railroad Club and the Society of Automotive Engineers at New York, September 19, 1924.

necessary, the cost runs up. Ample power therefore is necessary to assure long life, low maintenance cost and dependability.

On the other hand, excess power is costly and therefore unwarranted. Determination should be intelligently made between the two extremes, including a review of the local conditions of any particular problem by some one who is sufficiently familiar with the engineering of the subject. The spread in power ratings is indicated in Table I.

One feature not to be overlooked is the net horsepower available for driving the car, and that means the total horsepower of the engine less the demand of auxiliaries such as the fan or the blower, the air-compressor, the generator and any pumps or other apparatus requiring power. Under usual operating conditions this auxiliary demand will run about 10 or 12 per cent of the horsepower delivered by the engine. It is also necessary to consider the loss of power involved in the method of power transmission between the engine flywheel and the rail. The efficiency of the hydraulic system seems to be about 69 per cent; that of the gas-electric, about 72; and that of the geared car, about 80 per cent. For usual conditions of grade and speed, a loaded weight of car of between 300 and 400 lb. per total brake horsepower is about right, depending on the transmission selected.

Six-wheel cars, driven by highway truck type engines, except for very limited use, seem to be out of the running. The eight-wheel car with a six-cylinder engine has taken the lead, since in the four-cylinder truck engine the horsepower and the permissible wheelbase with a rigid rear axle are the limiting factors. This development has decreased the interest of motor truck builders in the rail car proposition, because it offers practically no outlet for standard parts production. Further, the demand for rail cars will never favor anything approximating the quantity production methods inherent in motor truck construction.

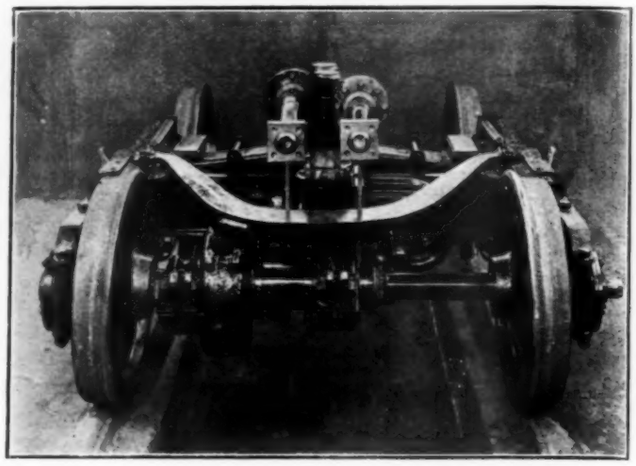
Transmission Systems

Transmission systems, including the control, constitute the main consideration by all interested in the gasoline rail-car. The clutch, change gear, propeller shaft system continues most popular because of its low cost, light weight, simplicity and dependability, largely because a demand for remote control, either in single cars or in multiple units, has not been great enough to displace single direction operation.

Hydraulic gear shifting is a problem not undertaken on rail cars either by railroad engineers or by rail car builders. It is an unfamiliar subject to railroad engineers and therefore a job for rail car promoters to develop and sell to railroad men, if it possesses any merit. Electro-pneumatic control has had some attention, but it sounds complicated to the railroad man, who, from experience, prefers simplicity in design. Extra weight and cost also are factors. It is predicted that it will be something of a job to sell railroad men electro-pneumatic control and especially those applications involving that control with two engines on one car.

Well designed clutch, change gear, propeller shaft systems have given good results in service. The three Mack cars on the New Haven have jointly run nearly 250,000 miles and have had very little attention paid to their transmission systems.

Generous bearing surfaces and strength of parts should prevail because dependability is of first importance and the small additional weight necessary is well placed. Low angularity on propeller-shafts is very important and is another reason favoring placing the engines of change-gear cars under a hood rather than in the car body. The relation to the front truck and the car body as regards overhang is a third reason.



End View of the Hydraulic Motor Truck, Showing the Gear Case and Motor Support on the Axle

Recent developments of the gas-electric car are interesting and very promising of success, especially where car size, weight and power make gear-shifting difficult or where double end or multiple unit control is desirable. However, at present a 60-passenger car with remote control either through electric or hydraulic transmission costs from $10,000 to $12,000 more than a change gear, propeller shaft car of the same capacity. Also, it costs more to operate because of the lower transmission efficiency and the greater weight. The weight is approximately from 10 to 20 per cent greater than with a change gear car; hence remote control exacts a heavy premium per unit of car capacity. Therefore, where costs are of first consideration, the change gear type is likely to hold the field for some time to come.

The New Haven Hydraulic Car

When, two years ago, the New Haven needed a remote-controlled 60-passenger car and the gas-electric type was not at its present favorable stage of development, recourse was

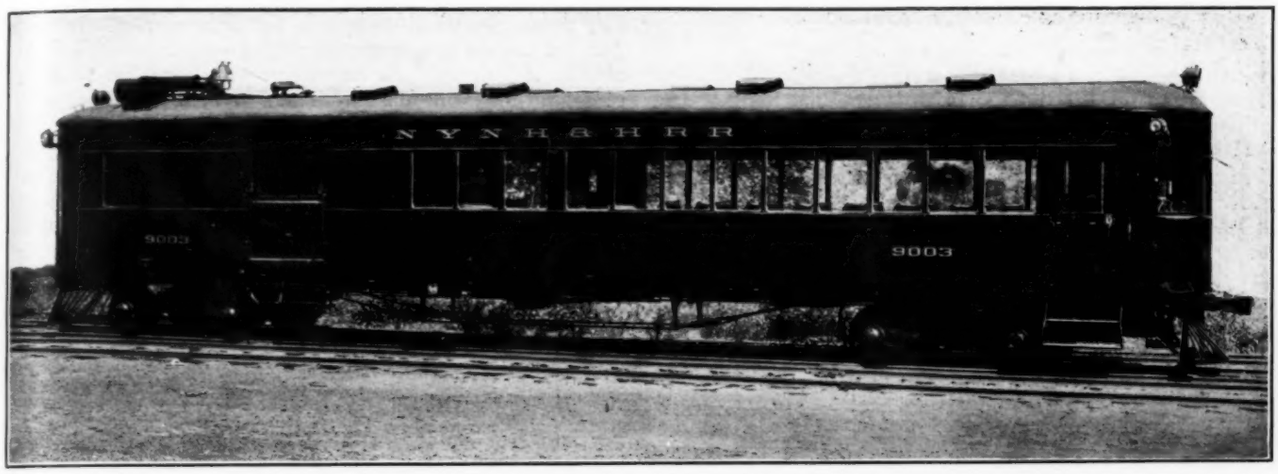
TABLE I—ENGINE SIZES AND CAR WEIGHTS OF GASOLINE RAIL CARS

Make of car	Engine rating, B.h.p.	Weight of car, lb. Light	Weight of car, lb. Loaded	Passenger capacity	Loaded car weight per brake horsepower, lb.	Type of drive
Brill 55	68	29,000	36,000	38	530	Gears
Mack AC	64	23,700	31,300	35	490	Gears
Mack AH	140	57,000	65,000	52	465	Gears
Brill, New Haven	150	41,000	49,800	50	332	Gears
Sykes, New Haven	150	35,500	44,550	45	297	Gears
Brill 65	150	34,000	41,000	38	274	Gears
Brill 75	250	50,000	61,800	50	244	Gears
Sykes, Chicago, Great Western[1]	225	39,000[a] 22,000[b] 61,000[c]	45,800[a] 28,600[b] 74,400[c]	30[a] 44[b] 74[c]	203[a] 330[c]	Gears
New Haven, hydraulic	170	52,800	64,100	60	378	Hydraulic
New Haven, Brill-General Electric	225	70,000	81,150	60	361	Electric
General Electric (old type)	200	107,000	124,200	86	621	Old type electric

[1] Two-car train. [a] Power car. [b] Trailer. [c] Train.

had to the hydraulic system known as the Waterbury speed-gear, and a car* was built weighing about 52,000 lb. without passengers. It has since operated over 10,000 miles, including service during the winter of 1923-1924. The power plant is a Ricardo six-cylinder engine of 5⅝-in. bore and 7½-in. stroke. It is rated at 170 brake horsepower at 1,200 revolutions per minute, the operating speed. The Waterbury reduction-gears to the engine, which is operated at a governed speed of 1,200 revolutions per minute.

The hydraulic transmission is the best yet available of a purely mechanical nature involving remote control for large rail-cars. For single-car operation it will compete with the gas-electric on the basis of first cost, transmission efficiency and economy of maintenance. Neither the hydraulic system



Motor Car Equipped with Hydraulic Transmission, Which Seats 60 Passengers

equipment consists of a 100-hp. hydraulic pump and two 50-hp. hydraulic motors, one connected through spur gears to an axle of each truck, the lattter being loaded eccentrically in the ratio 60 to 40 to increase adhesion.

The car is controlled from either end. The control is accomplished by operating the so-called tilting-box of the hydraulic pump, through which the displacement of the pump plungers is varied between zero and maximum, and which also is reversible. Oil, at pressures up to 800 lb. per square inch, is driven by the pump to the fixed-displacement motors geared to the axles. Specially designed universal pipe-joints satisfactorily handle the movement of the trucks relative to the car body. The pump is connected by

*See the *Railway Age* for June 14, 1924, page 1507, for a description of this car.

nor the gas-electric permits the same economy of weight and floor space that the change gear design gives.

Gear Ratio

Success or failure with a given car and engine may depend upon the gear ratios. They should be such as to permit the engine to develop the desired power at a favorable and therefore moderate engine speed. They should also be such

One of the Early Rail Motor Cars Operated by the N. Y. N. H. & H. Since 1922—In the First Five Months It Made 533 Trips Totaling 12,441 Miles, with Total Delays per Trip of 0.4 Minute

that reasonably high car speeds will obtain at moderate engine speeds.

The lower engine speeds also mean less vibration and noise, which contributes to the comfort of the passengers. It is a well-known fact that a gasoline engine operates more smoothly at a given high speed when under load than when light. This fact must be kept in mind in connection with

the gear ratio, for at times the engine will be called upon to furnish only a small amount of power but at a high car speed. Under these conditions the engine operating at the lower speeds will give the best operating car because the vibration and noise will be less. Current designs of gear-box arrangement giving six gear-ratios provide the necessary flexibility with two so-called direct drives.

Single and Double-End Control

For most railroads, the question of single end versus double end control cars is not troublesome. The New Haven, with some terminals in thickly settled centers and with engine houses and turntables so located as to be reached only by movements through extensive yards, is not so well situated. A double end controlled car that can make a turn in 5 min., where a single end car would require 30 min. at least and, in times of unfavorable traffic conditions, even longer, is almost a necessity. On one assignment a double end car had a schedule calling for a five-minute turn at each end of a one-hour run. The car could be made ready while the baggage and the passengers were discharging, as it was only necessary to change control handles and markers. From the operating man's standpoint a double end car is unquestionably more flexible and desirable and capable of greater use than a single end car.

Closely associated with double end control is multiple unit control and operation. For multiple unit operation either the electric generator, electric motor combination or the mechanical gear, electro-pneumatic control must be used. Trailer operation with a single end car is of course fairly common, but the tendency is to run the trailer most of the time under conditions where one large eight-wheel car would be better.

Car Performance

To have a unit car take satisfactorily with the operating department and the public, it must have good speed characteristics. A reasonably fast car should have a balancing speed of between 45 and 50 m.p.h. on level tangent track and of approximately 25 m.p.h. on grades up to two per cent. On certain small roads the passengers carried are not so exacting regarding fast operation as those nearer the larger cities; accordingly, the above specifications should be modified considerably.

On systems where unit cars must use portions of the main line in their trips and also make connections with through trains they must have a speed high enough to keep their place without holding up traffic. The maximum speed must be considered with respect to car size, weight and construction, so that comfort of the passengers, safety and good riding qualities shall be assured.

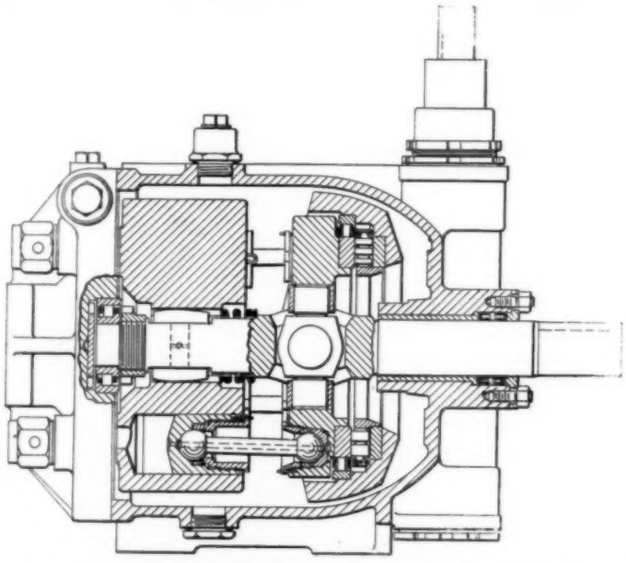
Distribution of Car Space

To obtain the greatest possible number of seats per pound of material, a seating arrangement of two on one side and three on the other side has been adopted. In the gasoline cars in operation for nearly three years this has proved satisfactory; in fact, so satisfactory that the New Haven has converted a number of its main line coaches in commuter service, and expects to convert more, to the three and two arrangement. A single passenger in a seat arranged for two is comfortable, as are two passengers in a seat arranged for three. On this basis the car must be loaded to 60 per cent of its capacity before any passenger has only his alloted space. New Haven gasoline cars operate at such a good load-factor for only a small percentage of their time. Special attention was given to obtain a light-weight seat that would be strong and ample in room. The cushions are 15 in. wide and spaced 28½ in. between centers. The seats holding two passengers are 33 in. wide and those holding three are 51 in. wide.

In small cars using an engine of 64 brake horsepower and seating approximately 35 passengers, a baggage room 6 ft. long is about as large as it is possible to provide. In cars using a 150-brake horsepower engine and seating 40 or 45 passengers, a baggage room 8 or 9 ft. long can be used. In the largest cars, using 225 or 250-brake horsepower engines, a baggage room from 12 feet to 16 feet long may be used. Folding benches located in a baggage room can accommodate passengers when baggage is not being carried. In large cars for use on long trips a smoking compartment is desirable as it satisfies some passengers and leaves no room for complaint regarding the curtailment of facilities.

General Design

The car wheel base should be made as long as possible, and the overhang of the body at both ends of the car should be kept as short as possible. A car with a long wheelbase rides better and operates the highway crossing electric signals better. All wheels should be pressed on the axles and anti-friction bearings mounted outside. In the car body and truck frames the lightest possible material and sections that are consistent with strength and ease of maintenance should be used. In many cases this means the use of alloy steels or other special high quality material. Cars built or building, for the New York, New Haven & Hartford have bodies of a composite construction using T-bars or angles with wood members secured to them. The floors and the sides have been insulated to help keep the car warm. Outside sheathing and other steel plates should be copper bearing steel having a copper content of about ¼ per cent. The life of these plates is double that of the ordinary plate and their first cost is but little more.



A Section Through the Hydraulic Motor Which Forms Part of the Waterbury Transmission System

A good type of ventilator should be used in passenger, baggage and engine rooms. In cases where the engine is enclosed in the body, special care should be taken to assure ample ventilation in the engine room.

In cars operating in cold climates adequate provision must be made for heating by some means other than the engine exhaust, otherwise, unless the engine is working hard at all times, the car will be cold. A coal heater with a hot blast air fan distributing the heated air through a duct along one side of the car at the truss plank is satisfactory, and has received the approval of the public utilities commissions in several states.

The question of providing a dry hopper or not is one that can be settled only by the service requirements. If possible, it should be omitted.

Coat-hooks and basket-racks keep the aisles and seats clear and promote comfort and speed of loading and unloading. Advertising-racks located under the basket-racks and on bulkheads are a source of revenue which should be used.

For lighting the car and operating the engine starting motor, a large and substantial storage battery is necessary. To keep the battery properly charged a generator of adequate size must be used to meet winter requirements when lights are used for a long time while the car is standing and when the duty of starting the engine is high. Generators range in size from 250 watts on the small cars to one kilowatt and over on the large cars. The smaller generators can be mounted directly on the engine, but the larger ones require a special drive. While 6-volt generators and miniature lamps are used on small cars, the large cars should have 32-volt generators and standard screw sockets. The wiring should be done in an approved manner with approved switches, fuse blocks, junction boxes and similar fittings.

For safety and to make good schedule speeds, air brakes are necessary even on the small cars. Diaphragm air brake systems have not proved adequate or satisfactory. The best brake system is one using a foundation brake rigging similar to that used on standard railroad cars, but of smaller size, supplied with air from small mechanically driven compressors.

The principal purpose in using gasoline rail cars instead of steam trains is to provide service to the public at less cost to the carrier. Three Mack cars that have been in service on the New Haven since January, 1922, having a credit of 217,000 miles to July 31, 1924, show that the cost per mile is approximately as given in Table II.

TABLE II—OPERATING COST PER MILE OF A SIX-WHEEL GASOLINE RAIL CAR

Fuel	$0.045
Lubricant	0.007
Maintenance and overhaul	0.120
Other supplies	0.006
Garage	0.024
Sub-total	$0.202
Train crew's wages	0.170
Total	$0.372

Discussion

Charles Gurnsey (the J. G. Brill Company) stated that he was in general agreement with Mr. Bean's outline of the essentials of gasoline rail car design, but that he would add one which Mr. Bean did not mention—at least 50 per cent of the weight of the car should be on the drivers. In speaking of gear ratios, he also pointed out that if a car has two or more efficient driving ratios, the higher ratio may be quite high, roughly around 1,200 feet per minute piston speed. Mr. Gurnsey suggested that the use of the weight per horsepower factor in comparing various motor cars is not entirely fair because it leaves out of consideraiton the operating speeds for which the cars are designed. He pointed out that there are many places where the speeds required on the New Haven could not be used and that for such places the cars with the higher weight ratios shown in Mr. Bean's table were entirely satisfactory. He suggested that a fairer comparison would be on a tractive force basis, giving the tractive force per ton at the operating speed. He presented the result of such a comparison of the cars shown in the table, calculating the tractive force by multiplying the torque of the engine at the speed under consideration by the mechanical efficiency times the gear ratio, and dividing by the wheel radius. This shows a much closer agreement among the various types of cars at the normal operating speeds than does the weight per horsepower.

C. M. Manly (Manly & Veal, consulting engineers) expressed surprise at the low efficiency obtained by the hydraulic transmission mentioned by Mr. Bean. He stated that in 1909 in tests conducted with a hydraulic transmission on a small car, the transmission had actually delivered 80 per cent of the power. He also stated that the hydraulic transmission will give a higher acceleration than either the electric or mechanical transmissions.

During the discussion attention was also called to the fact that hydraulic transmission when doing the least work is pumping the most oil and, therefore, operating at the lowest efficiency because of the friction losses, and when doing the most work, at slow speeds, it is operating at the greatest efficiency because it is pumping the least oil.

In speaking of the extent of the New York, New Haven & Hartford's experience with gasoline rail cars, Mr. Bean stated that with the deliveries of the cars now in order, which will be completed in about six months, the road will have a total of 25 cars of various types.

Railway Executives Plan to Stabilize Employment

A THOROUGH INQUIRY into the practicability and the means of further stabilizing railroad work and employment with a view to avoiding, as far as practicable, the reduction of forces and of purchases in dull times, and of distributing the expenditures more equally between times of depression and times of prosperity, thus substantially aiding the stabilization of general business conditions, was instituted by the executive committee of the Association of Railway Executives at a meeting in New York City on September 18. It is hoped that the inquiry may develop results of far-reaching importance in the direction of reducing seasonal and periodical unemployment in the railroad service and in industries largely dependent upon railroad purchases, with consequent effects on general business.

A committee of ten prominent railway executives, headed by President Rea of the Pennsylvania, was appointed to make a thorough study of the subject in its various phases, to confer with the Interstate Commerce Commission with a view to obtaining its suggestions and assistance, and to report back to the executive committee.

The meeting of the executive committee was held for the purpose of considering several important subjects of interest to the railroads and was followed by another meeting of the board of directors of the American Railway Association on September 19. After a general discussion of the matter of making additional progress in stabilizing employment the executive committee adopted the following resolutions:

"Mindful of the continuing duty, under the law, of railroad managers to maintain economical and efficient management and operation, and recognizing that one of the most important factors in securing this result is the maintenance of skilled and permanent working forces, who enjoy, so far as possible, stable employment under proper working conditions, and commending the progress already made in this direction, the Association of Railway Executives, acting through its Executive Committee, hereby resolves:

"1. That, notwithstanding the necessity which unfortunately from time to time is forced upon the railroads to curtail purchases and reduce forces because of serious falling off in the volume of traffic or because of inadequate rates, resulting in meager and inadequate operating revenues, the railroads, in the continued effort to promote economy and efficiency of operation and the best interests of their employees, and to contribute as largely as possible to the stabilization of general business conditions, hereby declare their purpose to enter upon an immediate inquiry into the practicability and

the means of further stabilizing work and employment, and to seek a conference with the Interstate Commerce Commission upon the subject, in order to obtain its views as to the important accounting and financial problems involved and to enlist its sympathy and assistance in working out a practical and helpful result.

"2. That the Chairman is directed to appoint a committee to make a thorough study of the subject, develop its various phases, confer with the Interstate Commerce Commission in respect to it, inviting its suggestions and assistance, and make report to the Executive Committee as soon as practicable."

The following committee was appointed to carry out this resolution:

Samuel Rea, president, Pennsylvania; Daniel Willard, president, Baltimore & Ohio; P. E. Crowley, president, New York Central Lines; C. R. Gray, president, Union Pacific; E. J. Pearson, president, New York, New Haven & Hartford; J. Kruttschnitt, chairman of the board, Southern Pacific; W. R. Cole, president, Nashville, Chattanooga & St. Louis; H. E. Byram, president, Chicago, Milwaukee & St. Paul; L. W. Baldwin, president, Missouri Pacific; L. F. Loree, president, Delaware & Hudson.

The record made by the railroads of service to the public during the last year and a half was reviewed and, on reports from all sections, was found to show an unexampled performance. The establishment by shippers, at the request of the Car Service Division of the American Railway Association, of Regional Advisory Boards made up of representatives of the shipping public for conference and suggestions to railroad managements in respect to the needs of the public for service, and for discussion of the problems both of the shipping public and of railroad management, has proved itself to be of the greatest advantage in bringing about a satisfactory solution of service problems, and was highly approved by the Association of Executives. Attention was called to the fact that the excellence and entirely satisfactory character of the transportation service rendered the public is now being generally recognized not only by the shippers themselves but by those in public authority clothed with the duty of supervision.

The meeting emphasized the necessity of continued efforts to create a more complete understanding on the part of the public of railroad problems and of the necessity, in order that service may be adequate, that there should be adequate revenues from operation. It was determined to continue the effort to secure the recognition of the principle that stability in regulation is essential to the railroad industry and is in the best interests of industry generally, and that there could not, in the public interest, be any step backward in the matter of reasonably fostering and preserving the transportation facilities of the country.

As a means of securing stability in regulation and of having this essential industry regulated on business instead of political principles, a resolution was adopted calling attention to the necessity that rates should be regulated by an administrative body, after hearing and a consideration of all the economic factors involved, and not by direct legislation.

Present demands for transportation are being fully met without difficulty by the rail carriers of the country, according to the report of the Car Service Division submitted to the board of directors of the American Railway Association at the meeting on September 19.

"The roads in the three western districts," said the report, "at the present time have 102.4 per cent of their ownership of box cars on line; also they have 61.5 per cent of their system cars at home.

"This is the best location of box car equipment, with respect to both home cars on owning lines and total cars in Western districts, that has ever existed so far as the records of the Car Service Division disclose. This Western movement of empty box cars from the East, through Chicago and St. Louis alone, has averaged since May 4, 813 empty box cars per day of Western ownership. With the continuation of this even flow of box cars to the Western railroads, supplementing the already favorable box car condition in the West, it is our belief that the movement of agricultural crops in that territory will be taken care of without difficulty this year.

"All demands for refrigerator cars for the movement of perishable traffic have also been met without any shortage of cars up to this time. It is anticipated that the peak movement from California will occur about the last week of September and the first week of October. According to the latest figures available, which are those for September 1, the Santa Fe and the Southern Pacific had on their lines 32,778 refrigerator cars, which is an increase of 7,021 cars over the number they had on hand last year. On the Santa Fe and the Southern Pacific lines during August, 20,311 cars of perishable traffic were loaded and during this period the cars available in California for immediate loading increased 5,348 cars, indicating very clearly that there is a prompt return movement of the equipment, and in addition they have been assisted with railroad owned cars and refrigerator cars of other private line car companies. All railroads have been asked to specialize on the return movement of this refrigerator equipment owned by the California lines with the hope that the peak movement of the perishable traffic will be taken care of without any serious shortage of equipment."

Taking up the condition of equipment, the report showed that on September 1, freight cars in need of repairs totaled 210,109 or 9.2 per cent of the number on line compared with 175,327 or 7.7 per cent on the same date last year.

As to locomotives, 15 per cent of the number on line were in need of heavy repairs on September 1 as compared with 14.7 per cent last year, and 1.9 per cent awaited light repairs as compared with 1.8 per cent last year.

In respect to locomotives, the railroads were in the best condition on September 1 to meet the seasonal fall increase in traffic they have been in since early this year, there having been on that date, 53,618 serviceable locomotives on hand, an increase of 726 over the number reported on August 15 and the largest number reported at any one time since January 1 this year, when there were 54,031. The railroads also had 6,762 surplus locomotives in good repair on September 1st compared with 2,714 on September 1, 1923.

Surplus freight cars in serviceable condition on September 1 totaled 231,677 compared with 66,559 on the same date last year.

While the usual fall seasonal increase in loading of revenue freight is now in process, reports to the Car Service Division from the railroads show that from the first of the year to September 6, inclusive, there has been a decrease of 1,606,782 or 4.7 per cent in the number of cars loaded with revenue freight as compared with the corresponding period last year. Loading of grain and grain products, however, shows an increase of 127,497 cars or 8.5 per cent over the corresponding period last year while merchandise and less than carload freight shows an increase of 269,179 cars or 3.3 per cent.

The main reason, however, for a falling off in loading compared with 1923 is the decline in the loading of coal, coke and ore. Coal alone shows a decrease of 1,071,751 cars or 16.1 per cent under the same period last year while there is a decrease of more than 32 per cent in the number of cars loaded with coke and a decrease of nearly 27 per cent in ore loading.

While loading of miscellaneous freight has been increasing during the past month, the cumulative figures for the period from January 1 to September 6, inclusive, show a decrease of more than 2 per cent under the same period last year. Live stock and forest products show a slight decrease under 1923.

Practical Value of Co-operation Demonstrated*

Immediate Results Followed the Cultivation of a Spirit of Real Co-operation

By Elmo Edwards
Assistant to Purchasing Agent, Spokane, Portland & Seattle Railway

ASSUMING FIRST that the railroad company's property is being managed by a man who is seriously seeking the co-operation of the rank-and-file of employees; who recognizes their needs as well as the interests of the owners and his own personal advantage, and who is a manager who enjoys the respectful confidence of his superintendents as well as the trustees who elected him to his position; such a man may bring about co-operation between the railway and its employees in the interest of efficiency by making the employees from the superintendent down through the long list of classes—i.e., trainmasters, dispatchers, train and enginemen, station agents, roadmasters, section foremen, B and B superintendents, bridge foremen and carpenters to the lonely track walker; through the mechanical superintendent, shop foremen and mechanics to the laborers in and around the shops, stores and terminal grounds; through the chief accounting officer, assistants, traveling auditors, heads of accounting bureaus and clerks to the lowest salaried ticket assorter—*a part of the management.*

Cards Face Up on the Table

To do this the owners of the property, expressing their will through the trustees in the selection of president, vice-presidents in charge of operations and general manager, must be willing for the management to *show its hand; all cards face up on the table, with no hedging, no subterfuge and no deceit.*

Given the plain facts in an unmistakably truthful manner regarding the company's financial condition, its revenues from all sources, its expenditures for all needs—such as operating material and supplies, labor costs, interest requirements, taxes, budget items and other extraordinary expenditures and unusual drains upon cash resources which affect the income page of the monthly statement of accounts—the average railroad employee will change overnight from a disgruntled waster of company time and material, with his ill-considered demands for increased pay and lessened hours into a thoughtful adherent, for the company's benefit, of the same rules of economy practiced in his own personal affairs. The employee who does not respond to this fair, four-square attitude on the part of the management as expressed through the properly accredited representatives of the chief operating official must be carefully, however ruthlessly, weeded out for the benefit of the faithful majority.

A Specific Example

Having in mind the necessity for reference to specific methods, the writer has knowledge of a plan used by one company which found it necessary to raise the morale of its employees in the interests of economy and efficiency. It had become advisable to cut operating expenses in every possible way—even to the extent of deferring maintenance—and to seek compromise in tax payments while husbanding the actual cash on hand to meet payrolls. The depressed condition persisted to such extent that a default in payment of bond interest occurred and a receivership followed. The receiver, facing the possible necessity of discontinuing operations immediately, adopted a policy of wide-open publicity in dealing with the employees, particularly the unionized classes, and the public in general.

Through his auditor he formed two committees which, starting as a stationary committee and a freight claim prevention committee, later were consolidated and enlarged to become a virtual advisory board for heads of departments in charge of all kinds of operating matters. Representatives of the general manager's office, traffic department, accounting department, mechanical and operating departments, met in conference with shop foremen, car foremen, roadmasters, yardmen, trainmen, station agents and every other class of employee who had any part in the use of company time or material.

All classes of employees were taught the proper use of, and urged against abuse of material and supplies. They were shown to what extent such use or abuse affected the company's cash outlay. Car foremen were taught how to reconcile F.C.A. rules with A.R.A. Car Service Rules and how to inspect and repair cars offered in interchange to prevent back haul of equipment found at loading point to be unfit for the commodity for which intended, with particular reference to fruit and other perishable shipments, bulk grain, and lumber; station agents on the line were taught how to make such inspection and to direct such temporary repairs of small defects as would permit loading without loss or damage to lading, and to keep freight cars moving under load to prevent loss of potential earnings plus per diem paid on foreign line cars standing on "rip tracks."

Weekly Meetings

Weekly meetings were held at headquarters with attendance requested from the particular class desired to discuss the subjects docketed for a given meeting. Agents were relieved from duties to enable them to attend conferences. Periodically a train was run from headquarters across the division, picking up agents and other employees at outlying points for participation in all-day discussions on board, and dropped off at their respective stations on the return trip with a feeling of important helpfulness and recognition. No agent or section foreman was so disinterested that he did not have a suggestion, and when such suggestion was voiced it was tactfully taken up and discussed fully; its merits recognized and published with due credit to its sponsor; likewise its frailties were turned up to broad daylight by his neighbors at adjoining stations, thus relieving the committee of any embarrassment on account of its decided impracticability. Full details of these discussions were recorded and mimeographed and sent to all concerned, with careful reference occasionally to congratulatory letters from the general manager, who stood squarely back of his committee in its efforts.

There were less accidents in the yards and on the road. Equipment needed less attention in the shops, and was kept moving under revenue loads. There was a reduction in the amount of loss and damage and personal injury claims and costs of every nature diminished from the point of actual use of material all the way up the line to the general offices, until the ratio of operating expenses to earnings from opera-

*Submitted in the *Railway Age* competition on co-operation. Other contributions which have already been published will be found in the *Railway Age* of June 28, 1924, page 1805; July 12, page 51; July 26, page 153; August 9, page 235; August 23, page 323; September 6, page 411; September 13, page 453, and September 20, page 491.

tions stood at a figure favorably comparable with that of many roads enjoying much more prosperous traffic conditions. That property, in the hands of a receiver at the beginning of the year, paid all operating demands during the year, took care of all outstanding prior-to-receivership indebtednesses to other companies and individuals, such as material invoices, car service bills, freight and passenger traffic balances, etc., and at the end of the year was able to reorganize and face the railroad world without recourse to receiver's certificates or cash advances from the bond holders committee. After four years of operations, during which time old employees continued to earn their daily bread without the necessity of seeking employment elsewhere, with the resulting loss of seniority rights, the reorganized company is paying fair compensation to its forces, discounting material and supplies bills and after having paid interest on its bonds last year had a few thousand dollars left for disbursement to stockholders. Co-operation which became a staring necessity in time of distress saved the property for the employees and co-operation is now saving the property for the owners of the shares and bonds.

A Railroad President's Attitude

The president of another western road has a genial old gentleman in the ante room of his office whose duty it is to *permit any one to see the president.* This president's kindly attitude toward the employees, his interest in their personal affairs, his expressed appreciation of their loyalty and his many calls for conference have won for him the co-operation of his men and this co-operation is a large factor in his marked success in handling the property in his charge.

Conferences must be conducted by chairmen chosen for their tactful ability to get the management's idea across to the men; chairmen who can conduct meetings between higher and lower classes of employees with that democratic freedom of the railroad man who is too big to know the expression "class distinction."

The management's viewpoint must reach the men through a better qualified medium of exchange than the present day "next superior," who more times than not is a man who has no better knowledge of company needs than the men whose labors he is directing.

The mechanic's point of contact with the railroad company's interest is the shop or car foreman who is trying to make a record for his own particular niche in the organization regardless of the surrounding departments or the ability of the storekeeper to furnish new material where second-hand or so-called obsolete material would serve the purpose as well.

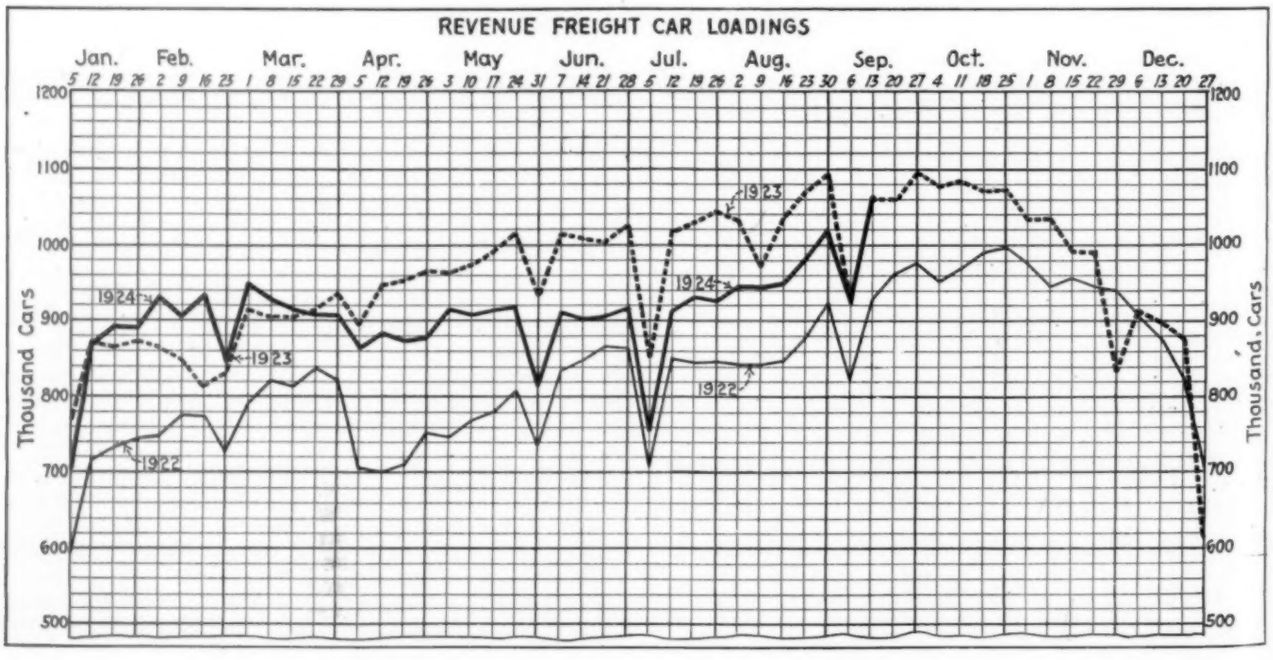
The station agent's only source of inspiration is a train dispatcher intent only on getting trains into terminals, or an accounting department clerk whose prime motive is to secure a balance in agent's account in order that a traffic journal entry may be closed; his demands upon the agent are not always couched in courteous terms, and are many times unreasonable.

In every department the organization's poorly informed minor officials, bureau heads, foreman and sub-foremen are driving employees into a state of disregard for any interest excepting the regular working hours and pay-day. This can be overcome only by a patiently sustained campaign of education along line of thinking as the management thinks—and the management's viewpoint will not succeed unless backed by sound reasoning. In other words employees must have the truth and must be made to feel the actual necessity for co-operation with the management.

Freight Car Loading

WASHINGTON, D. C.

REVENUE FREIGHT CAR LOADING in the week ended September 13 totalled 1,061,424 cars, which exceeded the loading in the corresponding week of last year for the first time this year since March. During the early part of the year the 1924 loading was in excess of that for last year for several weeks but for a long time this year's figures were running as much as 100,000 cars a week behind last year's figures. The increase as compared with last year was 861 cars and as compared with 1922 the increase was 124,203 cars. All classes of commodities showed heavier loading in the week of September 13 than in the week before and grain and grain products, coal, merchandise and miscellaneous showed increases as compared with last year, as did all districts except the Allegheny and the Northwestern. Ore was the only commodity classification to show a decrease as compared with 1922. Coal loading, 182,315



cars, was especially heavy as compared with the loading in previous weeks. Grain loading was also heavy although the total, 65,571 cars, was below the record-breaking figure of the week of August 30. The summary as compiled by the Car Service Division of the American Railway Association follows:

The freight car surplus continues to show a steady reduction and for the period September 1 to 7 averaged 194,306, a decrease of 37,371. The total included 97,089 coal cars and 69,244 box cars. For the Canadian roads the surplus was 24,750 cars, including 21,600 box cars.

REVENUE FREIGHT CAR LOADING, WEEK ENDED SEPTEMBER 13, 1924

Districts	1924	1923	1922
Eastern	240,896	232,389	231,463
Allegheny	210,889	219,293	200,245
Pocahontas	49,280	43,266	26,966
Southern	148,684	141,011	116,766
Northwestern	160,389	183,668	151,042
Central Western	173,440	168,017	152,700
Southwestern	77,846	72,919	58,039
Total Western districts	411,675	424,604	361,781
Commodities—			
Grain and grain products	66,571	54,451	51,745
Livestock	38,873	39,060	34,896
Coal	182,315	171,877	171,460
Coke	8,291	13,480	8,073
Forest products	69,519	74,986	56,930
Ore	47,834	76,659	53,578
Mdse. l.c.l.	254,314	249,417	233,703
Miscellaneous	393,707	380,633	326,836
Total	1,061,424	1,060,563	937,221
September 6	920,979	928,916	823,247
August 30	1,020,339	1,092,150	923,806
August 23	982,248	1,069,915	879,902
August 16	952,888	1,039,938	846,266
Cumulative total, January 1 to date	33,539,014	35,144,935	29,368,169

Car Loading in Canada

Movement of Western grain had a marked effect on the revenue car loadings at stations in Canada for the week ended September 13, which totalled 55,457 cars, an increase over the previous week of 7,864 cars and over the week ended August 30 an increase of 3,502 cars, heavier grain loading accounting for 2,331 cars and 2,513 cars, respectively, of these increases. Compared with the same week last year there was a decline of 6,298 cars. The lead secured in the early months of this year, however, has not been overcome and the cumulative total for 1924 is 90,871 cars ahead of that of 1923.

REVENUE CAR LOADINGS

Total for Canada	For the week ended—1924		
Commodity—	Aug. 30 Cars	Sept. 6 Cars	Sept. 13 Cars
Grain and grain products	3,977	4,159	6,490
Live stock	2,722	2,149	2,589
Coal	5,502	5,163	6,061
Coke	171	237	256
Lumber	3,528	3,185	3,649
Pulp wood	1,736	1,566	1,476
Pulp and paper	1,801	1,777	2,021
Other forest products	2,232	1,950	1,975
Ore	1,408	1,424	1,547
Merchandise, l. c. l.	15,584	14,106	15,623
Miscellaneous	13,294	11,868	13,770
Total cars loaded	51,955	47,593	55,457
Total cars received from connections	28,809	25,341	27,483
Total cars loaded for corresponding week 1923	57,056	51,550	61,755
Cumulative loading to date—1924	....	.....	1,956,003
Cumulative loading to date—1923	....	.....	1,865,132

A New Method of Analyzing Shop Requirements*

Engineering Studies Underlying Rehabilitation Work on the Denver & Rio Grande Western

By Paul L. Battey
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IN THESE DAYS of high costs of labor and materials as represented in the large investment in equipment units and their maintenance, a comprehensive analysis of all of the factors involved in economic operation brings out some phases of the problem, which are rather outstanding, in the light of what has been considered common practice. It is essential that a proper balance between the ever-increasing size of locomotives and cars, and the facilities for maintaining and operating this equipment, be constantly in effect. This is further necessitated by the development and use of more intricately designed locomotives and heavier units in both locomotives and cars, in order to minimize the time this expensive equipment is out of service.

It is this time element which the writer wishes to stress, as the use factor of equipment is determined by it, and after all is said and done, the end of all economics is to maintain the highest possible use factor of equipment which simply means keeping it in actual service on the road, and reducing the man hours in maintenance, consistent with adequate service.

There are several factors involved in getting this result other than that of maintenance facilities, such as traffic and climatic conditions, with respect to which no two railroads are alike.

Traffic charts have their peaks and depressions and any analysis of maintenance facilities must be made with traffic demands in mind. Frequently advantage may be taken of seasonable fluctuations in traffic in the conduct of maintenance work, resulting in considerable saving in annual costs even though added investment be required.

The underlying principles governing these problems may be illustrated by the discussion of an analysis recently made for J. H. Young, formerly receiver of the Denver & Rio Grande Western, in order that he could include in his budget for a general rehabilitation of the railroad as a whole, the terminal facilities and repair shops for the mechanical department so as to maintain the motive power and car equipment in first class operating condition.† The first problem was to ascertain the capital mileage in locomotives and cars as the equipment was found on the system. By capital mileage is meant the total available miles in each locomotive and car until its next general repair. To maintain rolling stock in par condition the same amount of mileage per annum should be restored by the shop facilities except insofar as obsolescence, requires the application of more modern and efficient devices.

Consider the Locomotive Department

The facilities for the locomotive department consist, of course, both of the engine terminals and the repair shops. The terminal facilities are of great importance under present conditions, both from an operating and a maintenance standpoint because of the necessity for balanced, classified and running repairs while the repair shops are purely a matter

*Abstracted from a paper presented before the Western Society of Engineers at Chicago on September 22.

†An account of the rehabilitation of the Denver & Rio Grande Western repair facilities was published in the *Railway Age* of May 17, 1924, page 1193.

of maintenance, except insofar as they affect the time of equipment in shop.

Our survey therefore, included a careful study of the disposition of the power on the several divisions and the particular local requirements of each division which, in this case, was unusually varied because of topographical conditions and the fact that these have required the maintenance of both standard and narrow-gage equipment. Consideration was given to the possibilities of longer divisions with the mountain type engines which were being purchased and the probability of the ultimate electrification of the mountain divisions.

One important phase of the analysis was the determination of the time each motive power unit was actually in service on the road. The results indicated that condition which is usually found on other roads—that the actual use-factor of a motive power unit to the operating department is between 20 and 30 per cent. A careful analysis of the distribution of locomotive hours in this case showed that approximately 65 per cent of engines were serviceable and the remaining 35 per cent unserviceable. Of the former, 15 per cent were in engine houses in the hands of mechanical department, 26 per cent in engine houses awaiting trains, 3 per cent at terminals and 20 per cent actually on the road or in yard switching service. Of the unserviceable 35 per cent, 5 per cent were waiting repairs, 24 per cent undergoing repairs in shops and engine houses and 6 per cent set aside as obsolete. These figures reflected the unusual condition during the shop strike for which allowances were made. With, roughly, a $50,000 investment represented in modern motive power units, plain economics demand the provision of adequate terminal facilities for quickly returning an engine to service, including all possible repairs that can be economically made at the terminal in order to keep the engine on the road making its expected mileage before general overhauling. On most roads there are periods of maximum demand for power when this is extremely important, on the other hand, there are lulls in traffic, reducing the necessity for quick handling. Evaluation of these opposing factors must be based upon the traffic charts.

Comprehensive analyses required full information as to character of assigned engines, engine failures, time required to turn and to wash boilers, and the numerous other factors involved. It required proper conclusions as to the size of round houses, boiler washing plants, water treatment, capacity and length of turntables and local repair facilities, all with the purpose of establishing a balanced condition of locomotive operating and repair facilities throughout the system, minimizing the dead engine mileage and the time equipment is out of service.

Distribution Is Important

The proper distribution of the mechanical maintenance facilities of a railroad is a matter of increasing importance because of many present day conditions that were not formerly of so much weight. Decentralization has become almost a necessity because of labor conditions and the high investment represented per unit of equipment. Many years of observation indicates the favorable results of keeping each unit of power in service as long as possible by adequate running repairs before shopping for a general overhauling.

Consideration of the investment value of equipment with relation to the investment in terminals and local repair facilities, clearly points to the distribution of facilities over the system rather than to provide meager terminal facilities, and one or more large general repair shops.

In the instance of the Denver & Rio Grande Western, the outcome of the analysis was the complete rehabilitation of the two principal repair shops located at the extreme termini of the road, at Denver and Salt Lake City, and extensive improvements in the terminal at Grand Junction, probably the most central point on the entire system. In fact, the analysis involved a careful study of the advisability of building an entirely new central repair plant at Grand Junction in lieu of the two existing plants at the east and west ends of the road. But the advantages of this plan were more than offset by disadvantages of greater weight. However the additions at Grand Junction were located with the idea that comprised the initial move toward the construction of a general repair plant at that point at such time as the capacity of the shops at Denver and the Salt Lake City may be exceeded.

The terminal facilities were improved by the installation of a new 110-ft. 450-ton, 3-bearing turntable and the lengthening the round house to take care of the new and larger engines contemplated for operation over the extended division from Denver. New drop pits were installed, together with modern heating and electric lighting installations. This, in conjunction with a new locomotive repair shop having sufficient capacity and equipment for four heavy engines, including modern tools, a Whiting locomotive hoist and crane service, provides for adequate and efficient handling of equipment on the division and makes it possible to realize on the economy of balancing the repair forces throughout the year as heavier repairs on several engines can be scheduled and carried on at this point, such engines being promptly returned to service.

Terminal improvements at two other points were also developed. At Salida, Colo., the junction point of the narrow-gage system with the standard-gage main line, the roundhouse and terminal repair facilities were extended, this installation being approximately the same in repair capacity as at Grand Junction, similar equipment being provided. But provision is also made in this plant for the handling and repairs of narrow-gage engines, the improvements including a new and deeper section to the roundhouse, together with a modern boiler washing plant and a steam heating system.

At Alamosa, Colo., which is practically the center of gravity of the southern Colorado section of the road and narrow-gage lines, a very fair repair shop was in service, relatively better than at other points on the line. The principal improvements required here to bring the plant up to balanced condition was an extension of the roundhouse with boiler washing and steam heating systems, a longer turntable, a small extension to the repair shops, some new and modern tools and a change to electrical drive throughout, with improvements to the power house. This constituted the betterments to the terminal facilities for motive power as determined by a careful study of existing and future requirements.

The Tractive Power Mileage Unit

Now as to the repair shops for general overhauling of power. The measure of capacity to determine the size of a locomotive shop should be the product of a tractive power unit and the locomotive miles consumed on the road for the reason that the weighted average of engine size must be considered with mileage to form a working factor. As before mentioned, it is necessary to put into the locomotives by renewals and repairs, the same number of miles that are taken out of them on the road. If for example, the total annual locomotive miles were 12,000,000 and the average tractive power of all locomotives making this mileage is, say 40,000 lb. or 40 units of 1,000 lb. each, the total "T.P.U." miles consumed on the road would be 480,000,000. To maintain the power in par condition shops must in a year, turn out the same number of T.P.U. miles. The measure of their gain or loss over any period of time may readily be ascertained by balancing production and consumption. A formula for arriving at erecting shop capacity may be expressed in the following terms.

$$C = \frac{NDL}{\left(\frac{MR}{MA}\right) Y}$$

where

C—Total lineal engine erecting space.
N—Number of engines tributary to shop.
D—Calendar days in shop.
L—Average length of space allowed per locomotive.
MR—Average T.P.U. mileage between repairs.
MA—Average T.P.U. mileage per locomotive per annum.
Y—Days per year (365).

This applies to a longitudinal shop but the formula may be used for a transverse shop by eliminating "L" and considering "C" as the number of pits. Or it may be applied, to determine the number of positions, to the horse shoe type of shop, a design which we have recently developed for progressive locomotive repairs, in a similar manner, but with this type the days in the shop would be less. After arriving at the capacity of the shops for normal maintenance as at present, a percentage should be added for growth in the size and number of locomotives for a period within which it would be uneconomical to make shop extensions. This additional capacity also provides the means of reducing to normal basis, the capital mileage deficit at the time of the new shop installation.

The probable future traffic development as influencing the future extension of new facilities or additional installations at other economical points, should receive consideration as well as the labor market, the source of supply of materials used in repairs and the continuation of existing facilities insofar as this can be economically accomplished, these latter factors being of vital importance with relation to the location of facilities.

No two roads have exactly the same conditions affecting the wear of equipment. It is therefore necessary to secure detailed information with regard to the distribution of the equipment, the grades and curvature of track, and the character of fuel and water used on various divisions. These together with the general climatic conditions largely determine the rate of repairs for machinery and tires as well as boiler and fire box renewals to locomotives. Therefore, a careful study of these factors is required in order properly to proportion the departmental relationship of the locomotive repair shops.

Mere shop capacity as measured in floor space which in the past has been considered the principal factor of output, has not always been considered at its proper value. From years of observation and contact with the problem, the writer has become convinced that many shops throughout the country have, to some extent, been used simply for storage space for equipment awaiting repairs, or its equivalent, in the extremely low rate of progress on repairs.

In the case of the present road, it was found that as measured by engine standing space under cover, there was actually more than necessary under modern shopping methods. The real output capacity of a modern railroad repair shop is dependent upon proper machine tool equipment, crane service and the organization and method of handling equipment through the shops, more than the actual floor space occupied by standing equipment undergoing repairs. The problem on the D. & R. G. W. insofar as locomotive repairs was concerned, was further complicated by the great diversity in the type and size of units including some very light engines and the largest mallet and mountain type engines in use, together with some gear drive equipment.

For economy of floor space in housing these engines while under repairs, obviously the most economical type of shop was the longitudinal, and further, this arrangement was necessitated by the requirements of the site in conjunction with existing buildings which it was deemed inadvisable to destroy.

On the D. & R. G. W. as before mentioned, largely because of diversity of equipment, the locomotive shop was so arranged that the service tracks run parallel with its length, but the routing of the locomotives is such within the shop that a progressive or semi-progressive handling results, which makes possible low unit repair costs in the various departments.

The Shop Is Departmentized

The shop is departmentized so far as it is feasible, machine tool groups for the various operations being placed immediately adjacent to the section of the erecting shop where such parts enter the assembly. Thus the wheel department is at the extreme end of the shop adjacent to the unwheeling and wheeling pits and immediately next is located the driving box department and so on. A balcony extending under the machine shop crane so as to be served by it, is provided for the brass department, head light, electrical and for other similar work. The boiler shop is located in the opposite end of the building from the wheel department but so arranged as to be served by the erecting and machine shop cranes, thus minimizing the movement of boiler work. The result of the departmental relationship is such as to reduce the lost time in the handling of parts to and from engines undergoing repairs to a minimum with a resulting economy in cost. The motive power materials coming mostly from the east, it was evident that a manufacturing department located in the Denver shop at the eastern terminus of the system would be an economical provision, parts produced here to be distributed over the system through the stores department. This has proved a successful innovation.

Because of the necessity of maintaining operation of the existing shops at both Denver and Salt Lake City, through the rehabilitation period, it was necessary to predetermine a schedule of operations, placing the various improvements in their proper sequence to secure a minimum of interference with the regular operation of the shops. This was carried out as planned in an entirely successful manner, the plants as finally rebuilt being completed including the making of plans for same, within a year.

The detailed design of the new locomotive repair shops was of course complicated by the presence of the existing structures. At Denver provision for a new locomotive erecting, machine, and boiler shop released the old locomotive shop for use as a blacksmith shop, the old shop being razed, together with a number of minor structures after the erection of the new shop. It also released a large section of the roundhouse which was of concrete construction, provided with overhead traveling crane and used for an erecting shop, several stalls in the end however, being retained for a tank shop where they could be served jointly with the boiler and machine shop by means of an outside yard crane.

Housing Car Repair Work

The requirements of the passenger car department, as determined by analysis, were such, that no material increase in facilities were required, and therefore improvements in this department were nominal and confined to the changing of some features which increased the output of existing buildings such as a new electrically operated transfer table at the Denver shop. This, however, is utilized in connection with the new facilities for freight car repairs it thereby serving a double purpose.

In approaching the problem of freight car repairs, a number of factors, were taken into consideration, which apparently, have not been given full weight, in the past, the outstanding one being the relation of the total cost of freight car repairs to the cost of motive power repairs, in this case, the cost of the freight car repairs being the larger. A comparative analysis of many other roads in the country shows much the same relationship, in some instances, cost of freight

car repairs being considerably in excess of the cost of motive power repairs, and in others about equal to, or slightly less.

For many years it has been the writer's belief that the railroads have failed to take advantage of the large saving which could easily be accomplished in the conduct of car repairs, not only from the standpoint of reduction of man hours required, but with the highly important advantage of reducing the days out of service to a fraction of what has been countenanced in the past. In approaching the problem of freight car repair facilities on the D. & R. G. W. and having made analysis of the factors contributing to the requirements for such, we gave full weight to the advantage of providing real repair shops, rather than extending the rip tracks. Here again, the measure of shop capacity is not mere standing space. Our conception of the problem centered around an entirely new plan of operation and now that the shops have been completed and in service for several months, they show a reduction of one-third in man hours. This is based on recent statement of T. H. Beacom, the receiver, and shows that our original estimate of 25 per cent had been exceeded to this extent. The bettered conditions have brought about a state of mind on the part of the employees almost unique in freight car repair departments.

It is plain that in order to do a given amount of work upon a car in the least possible time, that it is advantageous to work as many men as can be used efficiently. To accomplish this it was necessary to assign the men as far as possible to particular tasks and to arrange for handling of materials to the men in such a manner as to keep it out of their way and yet have it immediately at hand as required.

Under these conditions it is easily possible to increase the number of men per car from 1 or 1½ commonly employed under the old methods to 6 or 8 men, clearing the car for service in proportionately less time. Where the shops are relatively small and well distributed over the system, advantage can be taken by developing an esprit de corps, which has been lost in our large modern organizations. Both economy and interest are introduced where duplicate assembly lines are provided in the layout of the shop; first, in the ability to reduce shop capacity 50 per cent without in any way affecting the maximum economy of operation; and second, in the possibility of friendly competition between parallel gangs which adds zest to the work.

The problem of transportation of materials, including supplies, from the storehouse in connection with freight car repair department is as important as that of the locomotive shops. Here it involves greater distances and the interference of numerous tracks and in order to obtain maximum flexibility of the transportation units, the tractor and crane truck delivery system with well conditioned roadways is essential. In this instance, a regular delivery system was installed with convenient receiving stations in each department and suitable bins and racks located at each work station. In order to leave the main floor of the freight car repair shop as free as possible for the under structure work, a second floor or series of upper decks connected by counterbalanced bridges served by outside elevators, was installed, thus making possible deliveries direct to the work stations on the upper deck. All materials going into the superstructures, roofs, doors, running boards and other fixtures are handled conveniently from above. Here also the supplies are racked or binned immediately at hand for the specialized gangs.

The arrangement of the work in progressive movement from stripping to stenciling eliminates much interference from cross travel of both men and materials, and this together with the organization of the men into specialist groups markedly reduces the opportunity for accidents.

Car repairs, even though the units are scheduled in advance in classified groups, necessarily involve an element of variability inherently adverse to station to station methods as so successfully applied by manufacturing concerns. But by the provision of floating or balancing gangs of picked men chosen for their versatility on all classes of car repair work it is possible to approach the results obtained by manufacturers. The scheduling of cars entering shops and ordering all materials required well in advance based on careful inspection is absolutely necessary to realize the best results from this method of conducting car repairs.

An important phase of the design of locomotive and car repair plants and including engine terminals to a measurable extent is a carefully conceived stores department and delivery system. Millions of hours of skilled mechanics' time have been squandered in frequent trips from the work station to the store department for materials or tools and this can be saved almost entirely by a comprehensive and adequate system of delivery from the store house or yard to the receiving stations in various departments. Modern trucks and tractors, of varied design suitable for any application, are available and make possible the entire elimination of the old-fashioned industrial track and push car means of transportation still largely used in shop plants.

Standardization of both materials and tools greatly enhances the possible savings under a delivery system, and in connection with standardization attention should be drawn to the problem of handling the manufacturing for stores departments to the end of balancing the savings in quantity production cost against the carrying charges on stock, as this is the limit to which lot orders can be extended.

It will be noted that costs as related to the various factors of analysis have not been touched upon; this for the reason that costs always vary with local conditions and therefore mean little except in the light of these conditions. Cost factors are, of course, determined in every way possible and are utilized in any analysis as to the design of facilities, but these, as well as practically all factors in the problem, must be applied with a broad background of experience to arrive at a practicable solution. With many variables and empirical assumptions to deal with, experience is the guide to results. In the present instance it can be said that while the improvement program was predicated upon an estimated investment return of 20 per cent, Mr. Beacom has recently stated that results are measurably better than estimated. This in part is, no doubt, due to the increased efficiency of the organization he has been developing.

The extent of return upon investment is the final measure of accomplishment. Any program undertaken should be based upon a sound relation between investment in equipment and in maintenance facilities, and always with adequate service assured.

Industrial Leaders of New York "Mobilized" at the Engineering Societies' Building on "Defense Day"

Left to Right: H. P. Howell, Guy E. Tripp, Samuel McRoberts, Major-General R. L. Bullard, E. H. Gary, M. Friedsam and President P. E. Crowley of the New York Central.

Train Control Discussed by Signal Section

One Day of the Session at Boston Devoted to Papers On Installations, Followed by Extended Discussion

THE SIGNAL SECTION of the American Railway Association held its annual stated meeting at the New Ocean House, Swampscott, Mass., on September 23, 24 and 25, the outstanding feature of the convention being the train control program on Wednesday. The program for Tuesday, September 23, included the presentation and discussion of the reports of eight regular committees and the special committee on highway crossing protection. The entire day, Wednesday, was devoted to the subject of train control, the program including nine papers on train control, air brake equipment and train accidents, by representatives of railroads that have made extensive installation of train control and by representatives of the American Railway Association. The discussion was limited to five minutes by any one representative of a train control company or a representative member of a railroad.

W. M. Vandersluis (I. C.), chairman of the Signal Section, presided at the convention, at which there was an attendance of 517, which exceeds by 50 any previous record; including 100 guests of whom a score or more were prominent operating and mechanical officers.

An unusual feature of the convention was the special illumination of the grounds and exterior of the hotel. Large lanterns of colored glass panels, enclosing flashing lights, illuminated the walks and drives, while searchlights were focused on the exterior decorations, the flags, and along the beach. The lighting equipment was furnished by the General Electric Company and installed under the direction of the Illumination Committee, of which John Roberts (General Electric Company) is chairman.

Remarks by J. H. Hustis

J. H. Hustis, president of the Boston & Maine, opened the session on Tuesday morning with an address of welcome.

Mr. Hustis stated that during his railroad experience of some 45 years, signaling had done more than any other one development or facility to increase track capacity and to provide for greater safety. The radical difference between the old Dutch clock and hour-glass methods of time spacing train movements on early New England roads was contrasted with modern equipment of signals and interlocking. In touching on the question of train control, he said that the installation on the Boston & Maine between Boston, Mass., and Troy, N. Y., would cost approximately $1,600,000, which could better be used to increase the track capacity of other divisions by installing automatic signals, rather than adding train control to the territory mentioned, which is already signaled. The railroads, Mr. Hustis said, are welcoming short tests of train control, but he considers the installations required by the Interstate Commerce Commission as unwarranted and contrary to best judgment.

The Boston & Maine has about 64.8 per cent of its mileage signaled and prefers to complete such installation on the remainder of the road as soon as funds are available. Mr. Hustis said that over six years have elapsed since a passenger had been killed on the Boston & Maine, and that the signaling had been a vital factor in contributing to this record, during which time 61,000,000 passenger-miles had been handled. He expressed confidence that the members of the Signal Section could be depended upon to design and install train control systems successfully; however, the financial problems concern railroad credits which must be placed on a sound basis if non-productive improvement such as train control are demanded.

Train Control Program on Wednesday

The program on Wednesday was devoted exclusively to the subject of train control. The report of Committee X—Signaling Practice, including a history of the development of train control and a study of certain applications, was followed by several papers by railroad representatives and on extensive discussion.

The report of Committee X—Signaling Practice was divided into two parts: (1) the purpose of train control and historical data, including the various orders issued by governmental bodies; and (2) a study to determine to what extent wayside signals may be omitted in train control territory. In introducing the subject, the committee stated that automatic train control is proposed for the purpose of preventing that class of accidents, usually collision, due to failure of employees to observe, understand or obey signal indications. Such collisions can occur as a result of the following causes: (1) failure of brakes, (2) failure of signals to perform their function, (3) failure of employees to comply with rules or orders, (4) failure of employees to be governed by signal indications.

Train control will not eliminate failure of the brakes. Failures of signal equipment are very rare. Many of the collisions caused by the failure of employees to observe orders cannot be eliminated by train control. Therefore, the principal field for train control is under the fourth class wherein employees fail to be governed by signal indications. In the opinion of the committee the benefits to be derived from train control installations have, therefore, been greatly over-estimated in the minds of the public.

Extent to Which Wayside Signals May Be Omitted in Train Control Territory

Recognizing the possibilities of omitting wayside signals in train control territory, as suggested in the Interstate Commerce Commission's Order No. 13413, the report states that the Pennsylvania Railroad made a trial installation on its Lewistown branch of a continuous induction train control system with wayside signals only at passing sidings where trains are required to stop and receive instructions; the spacing of the trains being accomplished without wayside signals. Following preliminary tests of this installation, the Atchison, Topeka & Santa Fe is now making a similar installation on its Illinois division in the territory specified in I. C. C. Order No. 13413.

Train control of the continuous induction type, wherein the indicator in the cab reliably shows conditions ahead and instantly indicates changes in such conditions, appears to be the only system so far produced which may be used safely as a substitute for fixed signals for spacing trains. It utilizes the track circuit, together with a circuit superimposed on the track circuit, as the actuating medium. Impulses are picked up by induction coils on the locomotive and by means of vacuum tubes amplified so that they will operate a three-position relay on the locomotive which through proper contacts may give three indications by letters, "S," "R," and "A"—Slow, Restricted and Authorized Speed, or by colors Red, Yellow and Green. Thus the track circuit indications are carried onto the locomotive, making it possible to locate the signal in the locomotive cab instead of along the wayside.

Various reasons have been advanced to show the necessity for wayside signals in connection with train control. These, together with analyses, follow:

1. *To give sufficient advance information to properly handle train. Cab signal does not provide an indication that a train is approaching a caution signal.*

By providing additional braking distance to allow the use of a

delayed brake application, engineman can be given the equivalent of the advance information now received from wayside signals.

2. *To avoid the necessity of constantly observing cab indicator which would lessen observance of conditions ahead.*

Experience proves that the flip of the cab indicator attracts the eye. In addition to this, audible indications can be given to attract the engineman's attention to any change in the visual indicators.

3. *To provide means for giving proper information where trains are diverted at interlocking plants.*

Wayside signals should be used at such points.

4. *Wayside signals provide means for protecting trains when it is necessary to cut out the train control equipment on the engine.*

If experience shows that failures are so frequent that wayside signals are necessary for this reason, train control will be a failure.

5. *To make it possible for engineman to have complete control of air brakes as long as he properly handles train. This will avoid undesirable application of the brakes.*

Arrangement outlined in No. 1 takes care of this.

6. *To provide a stop indication ahead if an emergency application is required on account of obstruction of track due to wreck on adjoining track, switch opened ahead of train or other emergency that might set wayside signal at stop.*

Cab indicators take care of this.

Paragraph from general order putting automatic control on Lewistown branch of the Pennsylvania in service is as follows:

"When the cab indicator changes from 'A' to 'S', and remains at 'S', it will indicate possible failure of the apparatus or urgent necessity for a quick stop, and engineman must take immediate action necessary to stop as quickly as possible with safety; conductor or engineman will notify the superintendent from first available point of communication."

7. *To provide a check on proper operation of engine automatic control apparatus.*

If train control is a success, such a check is not necessary.

8. *To provide markers—to define the locations where change of indications might ordinarily be expected.*

Not needed except at stop points where wayside signals must be provided.

9. *To provide for making efficiency tests.*

Not needed. Train control provides necessary check.

10. *In case of accident, the presence of wayside signal and its condition after the accident may provide evidence that the engineman is negligent.*

No use except as a post-mortem, and then of doubtful value.

11. *To assist trackmen in locating broken rails and signalman in maintaining signals.*

Not of sufficient value to warrant additional cost of wayside signals.

12. *To prevent making engineman an automaton.*

The required acknowledgement of every change to a more restrictive indication, which must be made to prevent unnecessary delay or a stop, is the preventative.

13. *To provide information for detoured engines not equipped with cab indicators.*

If trains not equipped with train control are detoured at very frequent intervals and cannot be protected in some other way, wayside signals would be a necessity.

While an automatic signal may be made to display "Stop," ordinarily its most restrictive indication is "Stop and Proceed." After train has stopped it may proceed "running with caution expecting to find a train in the block, broken rail, or switch not properly set." As a speed control enforces the slow speed command, the stop seems unnecessary. If the stop at an automatic signal is unnecessary, then the automatic block signal would seem to be unnecessary, as the cab indicator tells the story.

It seems logical that the "Stop" indication would have to be provided by a fixed wayside signal to mark the point where it is necessary to hold a train until it is desired that it proceed. The "Proceed" indications can be given by the cab indicator, making the automatic wayside signal unnecessary.

Where wayside signals are used with train control, there are conflicts in the indications as follows:

(a) Automatic signal indicates "Proceed prepared to stop at next signal." Cab indicator shows "A" or "Green light" (a more favorable indication) until train reaches signal, then "R" or "Yellow light," and if the block in advance clears, cab indicator changes to "A" or "Green light," although fixed signal just passed showed "R" or "Yellow light."

(b) Automatic signal indicates "Proceed." Cab indicator indicates "A" or "Green light." After train passes fixed signal, wreck occurs ahead or switch is opened. Cab indicator changes to "S" or "Red light," although fixed signal just passed indicated "Proceed."

(c) Approaching a curve having a speed restriction, cab indicator shows "R" or "Yellow light;" fixed signal indicates "Proceed."

There are no installations of an intermittent type of train control without wayside signals.

Train control of the intermittent type is not affected by a change of conditions while a train is between roadside indicating points; therefore, an indication in the cab carried from one indication point to another may be misleading.

Conclusion

With train control of the continuous type, the only wayside signals required are those located where trains may be required to stop until authorized to proceed or where it is desired to give orders or instructions.

The first business on Wednesday morning was the reading of the report of Committee X on Automatic Train Control by J. A. Peabody (C. & N. W.). Mr. Peabody supplemented the report by the statement that the experimental installation on a secondary line of the Chicago & North Western had been taken out, and that the inspection of the installation on the Lewistown branch of the Pennsylvania by the Interstate Commerce Commission was now in progress, having been begun on September 16. The historical part of the report of Committee X had been prepared by G. E. Ellis.

The first comment on the report was by J. B. Latimer (C., B. & Q.) by letter. He believed the committee should be very slow to advise the abolition of visual roadside signals. Progress in such a far-reaching program should be made a step at a time. The Chicago, Burlington & Quincy, following the recent modification of the governmental requirements, had decided not to install speed-control apparatus. Continuous control cannot be had until you provide a source of alternating current, and for most roads this is a costly proposition. The simplicity and lower cost of systems with intermittent control embody important advantages.

Abstracts of Train Control Papers

The first twenty-minute paper scheduled on this subject was by A. H. Rudd, signal engineer of the Pennsylvania. Mr. Rudd presented a rapid outline of the history of automatic stops from 1880, when Vogt's apparatus was tried for many months on the Pennsylvania, and finally was abandoned after stopping a train-load of passengers in Gallitzin tunnel where breathing was not pleasant. The brakes had been set by the frangible pipe striking an icicle in the tunnel. Coming down to 1922, the speaker sketched the somewhat erratic course of the Interstate Commerce Commission down to the present time. It has finally consented to inspect the Pennsylvania's installation but has not extended for the Pennsylvania the time within which the governmental requirements must be fully complied with.

Mr. Rudd then presented a detailed argument in justification of his adoption of the Union Switch & Signal Company's continuous control, with some details of his experience during the 14 months that the system has been in use on the 49 miles of the Lewistown branch. He believes that from the engineman's viewpoint, that as an operating proposition cab signals will be as convenient as wayside visual signals, and equally safe. Within a year he expects this feature to be perfected. He showed a diagram showing for a series of months the number and frequency of days in which the system worked without a failure. All train operations on this section of road have been conducted under this system since July, 1923. He is quite sure that the continuous principle embodies elements of safety not attainable with any of the intermittent arrangements, whether these do or do not have the permissive feature. In all systems except the continuous the prescribed braking distance is a vital element, and that is a troublesome question on which Mr. Rudd finds no agreement.

The committee's outline having called for a statement of costs, actual, or estimated, or expected, Mr. Rudd touched upon the point, but only to say that automatic train control costs a lot more than it is worth!

Thomas S. Stevens (A., T. & S. F.) read a brief paper

on his experiences in the installation of the Union continuous control system on his road. He fully endorsed Mr. Rudd's views. This system had been adopted because of its merits and of restrictions and difficulties incident to the use of other systems. If it had been known that the government would allow the use of a flexible system like that in operation on the Chicago & Eastern Illinois the Santa Fe might possibly have made a different decision. Mr. Stevens has no doubt that automatic train control apparatus can be maintained and operated with a degree of efficiency equal to that now attained with automatic visual signals.

A. H. McKeen (Union Pacific) made a brief statement of his experiments with three systems of automatic train control over a period of five months, all three apparatuses being installed on one locomotive, the differently equipped sections of track being adjacent to each other—nine miles in all. He had no false clear failures but there were various troubles of other kinds. He is disposed, however, to reject ramp systems because of clearance difficulties and complications near platforms and in yards. It is desirable that the engine-carried apparatus for picking up the electric or magnetic impulse from the roadway be standardized without delay. All of the various devices could be made uniform. Mr. McKeen said that 88 per cent of Union Pacific main lines now have automatic block signals and that, but for the governmental requirements in regard to automatic train control, plans made three years ago for equipping the remaining 12 per cent would have been carried out by this time. As evidence of the progress made by his road in the improvement of automatic block signal operation during the past 18 years, he cited the averages of failures in the years 1905, 1915, 1920 and 1924; all failures, one in 40,000 operations; one in 70,000; one in 92,000; one in 132,000. False clear failures: 1905, one in 1,200,000; 1915, one in 2,500,000, and this year, one in 6,000,000. This statement elicited applause.

H. S. Balliet (N. Y. C.) read a history of the experiments with the Sprague system on the New York Central in 1922 and 1923. On this the reader is already informed from the report which was issued by the Interstate Commerce Commission. These experiments were confined to passenger-train conditions, but Mr. Balliet believes the apparatus suitable for freight train use. The Sprague system is to be installed on the New York Central main line between Herkimer, N. Y., and Fonda. Mr. Balliet read a paper prepared by W. E. Boland, of the Southern Pacific, describing the use on the Southern Pacific near Hayward, California, of the National Safety Appliance Company's intermittent induction system. With this system speed control is dealt with by spacing the locations of track apparatus. The system is thoroughly workable and meets the requirements of the Southern Pacific. A new forestalling device has lately been added.

J. C. Mock reported on the experiences of the Michigan Central in installing the G. R. S. continuous control system. As a preliminary extensive changes were made in the semaphore signals—lower to upper quadrant and two-position to three-position—and also in locations to make block sections of more satisfactory length to provide proper braking distances. No roadside stop-equipment has yet been installed.

George E. Ellis (A. R. A.) read a paper embodying a study of governmental train accident statistics showing the great improvement in safety of railroad operation since 1889 and calling attention to careless citations of collision records in which collisions not curable by an automatic stop are included in totals, thus greatly exaggerating the danger that is to be dealt with.

H. H. Orr, signal engineer of the Chicago & Eastern Illinois, described the installation of the Miller Train Control apparatus on the C. & E. I. This installation of 106 miles, double track, simple vamp type of train stop with the permissive feature is to be inspected by the Interstate Commerce Commission in the near future. The wayside apparatus is maintained by signal forces and the mechanical forces maintain the engine equipment. Short vamps at roundhouses enforce tests on entering and leaving the house.

B. T. Anderson (C. & O.) summarized the experience of the Chesapeake & Ohio with train control in the last eight years, on about 60 miles of track, equipped with the intermittent contact type of the American Train Control Company's apparatus. On the 21-mile direct current installation there are 17 trains a day and on the remaining mileage of alternating current equipment there are about 44 trains a day. Improvements are being made constantly, but the road is not as yet satisfied. The present records show one failure for 3,600 train movements as compared with signal-apparatus failures of one in 35,000 movements. The C. & O., as a pioneer in developing train control on single track, has learned that the automatic signals facilitated train movements, and that the train control has not limited the track capacity. He pointed out that the Southern, the R. F. & P. and the C. & O., which operate over joint track into Washington, were each making installations of non-interchangeable types of train control. Therefore, at this time developments should be limited to short installations. The maintenance of engine equipment on the C. & O. is handled by special train control forces.

Leroy Wyant (C., R. I. & P.) said that the installation of the Regan train control on the Rock Island consisted of 165 miles of double track with 102 locomotives equipped. Although the overlap control has a tendency to limit track capacity, the elimination of stops by the use of the permissive feature under speed control saves time and offsets other delays from other causes. Mr. Wyant expressed the opinion that the importance of interchangeability had been overemphasized. The differences in operating practices of different roads constitute the real factor to be considered.

Discussion on Train Control

The meeting was then thrown open for discussion with a strict limit of five minutes to each speaker.

J. F. Webb, Jr., of the International Signal Company, stated that his apparatus had been on test on the Erie for three years, during which time no false clear operation had been reported. Although some 12 shoes had been broken off all failures were on the safe side.

In a series of brake distance tests on the Erie, trains averaging 71 to 88 cars of approximately 6,500 tons were stopped in an average of 1,713 ft., the track being slightly down grade.

A. J. Brookins, of the Brookins Train Control Company, said that investments in unproductive equipment such as train control should be limited to the most simple devices, and suggested the more extensive use of the permissive feature. He also suggested that the American Railway Association take action to encourage combinations of desirable features of various inventors' and manufacturers' devices.

J. Beaumont, of the Regan Safety Devices Company, stated that on the Illinois division of the Rock Island, which is equipped with the Regan system, the train control had obviated the necessity for 6,078 freight train and 485 passenger train stops in the month of July. At a conservative figure of $1.92 per stop, as given in the report of the Economics Committee, the elimination of these stops represented a saving of $11,670 a month.

H. W. Richards, of the Richards Train Control Company, stated that a test of his system was now in service on the Maryland & Pennsylvania near Baltimore, Md., six miles of track and one locomotive being equipped.

K. E. Kellenberger, of the National Safety Appliances Company, pointed out that some train control systems may be so safe that the track capacity will be reduced, necessitat-

ing additional tracks. Although the government is interested primarily in safety, train operation is also considered important, as is evidenced by the reinsertion of the permissive feature. The ability of the National Company to make immediate deliveries was emphasized.

F. J. Sprague, of the Sprague Safety Signal & Control Company, pointed out that the reinsertion of the permissive feature was considered as tentative. He considers that the problem of handling freight trains on grades as not any more difficult to overcome than other engineering questions that have been met. The speed control serves to lessen the risk of a false clear operation.

T. S. Stevens (A., T. & S. F.) said that the motive power department of his road had fixed 8,000 ft. as the braking distance for an 80-car oil train at 40 m.p.h.

A. H. Rudd (Penn.) stated that after four months of test a standard table of braking distances had been prepared for passenger trains at 70 m.p.h., and that no figures were issued for freight trains on account of variations of loads and braking conditions.

Signals and Interlocking Were Discussed Tuesday

A definite outline of the factors to be considered in determining the type of interlocking which should be installed was submitted for discussion by Committee III—Power Interlocking. The major items to be considered with reference to a proposed plant are, location, traffic to be handled, type of motive power used, existing signaling, physical condition, and cost of construction and maintenance. A complete set of instructions for the installation, maintenance and operation of nickel, iron, alkaline storage batteries was submitted with forms for recording readings of tests and operating conditions.

The committee has made an extensive investigation to ascertain the requirements for technical instruction to be furnished to signal forces. Forty representative roads answered the questionnaire, the results being summarized as follows: 8 roads have a regular form of technical instruction and examine employees regularly; 25 roads examine employees on flagging rules, etc.; 20 roads have some form of apprenticeship courses and 6 roads conduct educational meetings regularly. The committee recommends that standard books on simple mathematics, physics, and electricity be used in presenting instructions to employees. It is the intention of the committee to develop books on the elementary principles of both electrical and mechanical signaling.

Committee II—Mechanical Interlocking submitted a specification for vertical locking for use on electro-mechanical interlocking machines. Standard layouts for track and signal numbering, spring combinations and dog charts are to be shown on drawings.

Reports on Block Signaling

Directions for the adjustments of a.c. track circuits to obtain high shunting sensitivity for light-weight equipment were submitted as information by Committee VIII—A. C. Signaling. Committee IV—D. C. Signaling submitted several important reports with reference to the safe operation of track circuits. Good rail bonding and clean ballast are two important factors governing the proper operation of automatic signals, and in order to determine limits for safe operation the committee has made extensive studies and established certain standards. The maximum rail resistance, which depends primarily on the bonding, should be not more than 0.15 ohm per 1,000 ft. of track or not over 0.90 ohm per track circuit. The minimum ballast resistance, which depends on the kind of ballast and the extent to which it is kept clear of the rails, should be 6 ohms per 1,000 ft. of track and 2 ohms per track circuit as a minimum for 2-ohm relays. On circuits using 4-ohm relays the minimum is 12 ohms per 1,000 ft. of track and 4 ohms per track circuit.

In investigating the effects of treated ties on track circuits the committee reports that the experience of many railroads, and the results of tests made, show that ties treated with zinc chloride, sodium fluoride and similar preservatives of chemical salts render ties comparatively highly conducting. Unless combined with some other material, such as creosote, these salts gradually leach out, particularly in damp climates, and eventually their influence on the resistance of roadbeds disappears. The use of ties so treated should be restricted to territory on which no track circuits are in service. If impossible to avoid their use in track circuited territory, they should be allowed to season for a period of not less than 3 months, preferably 6 months or more, before being placed in the track. If the use of unseasoned ties cannot be avoided, not more than 10 per cent should be renewed annually in track sections 3,000 ft. or less in length and a proportionally smaller percentage in longer sections. If ties are seasoned as recommended herein, 15 per cent may be renewed in a section not over 3,000 ft. long.

Ties treated with coal tar creosote have a resistance somewhat lower than that of untreated ties, but it is felt that track circuits can be operated successfully where ties treated by this process are installed. Any benefit due to this treatment may be considered as due to the increased life of the tie or postponed decay.

The resistance of ties treated with water gas tar measures considerably higher than that of untreated ties, which indicates that this impregnating material affords additional insulating qualities, and, from a track circuit standpoint, ties so treated should be used in preference to all others.

A new specification for illuminating oils was submitted for discussion by Committee XI—Chemicals; several revisions were also suggested for the specifications for jars, covers and sand trays for storage cells. A system of stamping fibre insulation used for insulated rail joints was submitted by the committee, the purpose being to establish a standard that would facilitate storekeeping and ensure proper parts being installed on different sizes and types of joints.

LOCAL LOADING and receipts from connections on the Missouri Pacific during August totaled 139,874 cars as compared with the former record of 138,938 cars established in 1923. A total of 101,945 cars were loaded locally on the system during August as compared with the former record of 99,444 also established last October.

P. & A.

A New Experimental Diesel Locomotive With Hydraulic Transmission on Trial in England

Traveling Engineers Complete Annual Program

Discuss Stoker, Booster and Oil Burning—A. G. Pack Speaks on Locomotive Maintenance

THE THIRTY-SECOND ANNUAL CONVENTION of the Traveling Engineers' Association closed at Chicago on September 19 with the election of the following officers for the ensuing year: President, W. J. Fee, Canadian National; first vice-president, J. N. Clark, Southern Pacific; second vice-president, J. E. Hurley, Wabash; third vice-president, J. D. Heyburn, St. Louis-San Francisco; fourth vice-president, James Fahey, Nickel Plate; fifth vice-president, Ralph Hammond, New York, New Haven & Hartford. David Meadows, Michigan Central, was re-elected treasurer, and the following were elected new members of the executive committee: A. N. Boyd, Canadian National; G. C. Jones, Atlantic Coast Line; H. B. Kelley, Pittsburgh & Lake Erie; Robert Collett, St. Louis-San Francisco; H. H. Wilson, Baltimore & Ohio; and C. J. Evans, Missouri-Kansas-Texas.

A suggestion was offered for the consideration of the Executive Committee by J. N. Clark, that a change in the date of the convention to a time in the year when the railroads are not handling their heaviest traffic, would enable a larger number of road foremen of engines to absent themselves from their duties long enough to attend the convention.

In last week's issue appeared abstracts of the opening addresses and the report on the work of the traveling engineer. The other principal items on the program were reports or papers on the following subjects: Locomotive Boosters; The Stoker Fired Locomotive and the Future Engineman; How to Improve Oil-burning on Locomotives; Lubrication and Its Effect on Locomotive Service; Conservation of Locomotive Fuel; Handling Passenger and Freight Trains, and Automatic Train Control. An address on locomotive maintenance was delivered by A. G. Pack, chief of the Bureau of Locomotive Inspection, and brief addresses were also made by G. A. Kell (Canadian National) and C. M. Kidd (Virginian), president of the Air Brake Association. Abstracts of Mr. Pack's address and of some of the more important reports and papers are given in the succeeding columns.

Locomotive Maintenance

By A. G. Pack

Chief of Bureau of Locomotive Inspection, Interstate Commerce Commission

The railroads have become as necessary to society as are the veins that carry the life blood to the various parts of the body. They distribute the commerce of the nation to the points where it can serve the most useful purpose. The locomotive is the heart of transportation and serves the same function for the railroads as the heart does for the body. Unless the heart acts efficiently the blood ceases to circulate freely and the limbs become paralyzed; unless the locomotive is maintained in a high state of efficiency, the arteries of transportation clog and business becomes stagnant and confused.

In considering the subject of locomotive maintenance, I do not come before you with new and untried theories. Everyone of you know what should be done, therefore, it generally becomes a question of doing or not doing that which you know should be done. The question arising is, "are you permitted by those in authority over you always to do the things that you know ought to be done at the proper time and place?" The Locomotive Inspection Law has placed upon every common carrier by railroad, a solemn duty, viz., to so construct, equip, and maintain their locomotives that they may be operated without unnecessary peril to life or limb; and has placed upon you, as employees of such carrier, the same solemn duty. It has given you an authority which cannot be properly evaded, and one which if taken advantage of will help you in having the things done that your training and experience has taught you should be done.

Enginemen, Like Other Workmen, Need Good Tools

The duties of Locomotive enginemen are among the most hazardous and exacting. If they are successfully to perform the duties to which they are assigned, they must be active and alert during every minute and every second from the time they take charge of the locomotive at the terminal until they are relieved at their destination. Locomotive enginemen are the one class of people who cannot afford to make mistakes or allow their memories to lapse; they too often pay the penalty with their lives, and the lives of those intrusted to their care. If the engineman is not provided with a machine, in other words, tools, in good condition capable of performing the work expected, it may not be expected that he can keep his mind concentrated on his many duties.

The Significance of Engine Failures

The many complex appurtenances and appliances which have been added in more recent years to make the locomotive more efficient and capable, require constant care if they are to be maintained in condition to serve the desired purpose. When minor or running repairs are neglected, it adds to the burden of operation and leads to engine failures, breakdowns and train delays. Every engine failure—so called—while on the line of road carries with it the potential of a serious and probably fatal acident. I have never found anyone who could estimate the cost of the average engine failure.

Interfere With Dispatching

Engine failures upset the prearranged plans of the train dispatchers, cause serious confusion on operating divisions, and have been known, in many instances, to lead to some of the most disastrous and costly wrecks. Many engine failures are caused by the failure to make repairs to defects of the most trivial nature. It has been charged, not however in general, that the defects to which federal inspectors take exceptions are of a trivial nature and that the repairs to such defects are trivial, with which I agree; but, when the failure of parts and appliances of the locomotive and tender cause injury and death and the serious loss of property, of which we have many records, it cannot be considered as a trivial matter. The proper time and place to make repairs is at the terminal and before locomotives are offered for service.

It is better, viewed from any angle, to have trains delayed at the terminal than it is to have engine failures, break-downs, and serious accidents on the line of road.

The Importance of Adequate Facilities

In considering locomotive maintenance, the subject naturally divides itself into two parts—classified repairs and roundhouse repairs. The backshop is the place where the heavier repairs should be made. The roundhouse is the place where the lighter or current running repairs should be made. When classified repairs are made in roundhouses or when running repairs are made in back-shops, the logical order of things is violated and consequently, unsatisfactory and inefficient results obtain. It is not uncommon to find large portions of roundhouses blocked with locomotives undergoing classified repairs which could be more promptly and economically made in the backshops, while locomotives which should receive terminal attention in the roundhouse are being repaired on the outside without facilities and where men are compelled to work under the most adverse conditions, exposed to the elements. It goes without saying that such methods tend toward improper repairs and higher cost of maintenance with extremely unsatisfactory results.

Some carriers have given a great deal of attention to shop and enginehouse facilities and to providing modern tools and machinery for dismantling, repairing, and assembling locomotives, until today we have many examples exemplifying the highest state of the art. These should be given earnest consideration by carriers that have not kept pace with the changed operating conditions and in providing and maintaining adequate shop and enginehouse facilities. Inadequate shop facilities and poor organization mean failure to make the best use of our resources; they mean higher labor cost and the added cost which results from holding locomotives out of revenue service, with the necessity for a greater number of locomotives to handle a given business. Terminal and shop facilities are potent dividend producers or reducers in proportion to the methods pursued and the efficiency of organization.

Make Repairs Currently

It seems hardly necessary to urge the importance of making proper inspections and proper repairs currently, because the results of failure to do this are too well known and because it is to the interest of everyone connected with the operation of railroads to have these things done. Nevertheless, during the past 13 years federal inspectors have been compelled to order withheld from service 48,836 locomotives because of defects which unnecessarily increased the peril of operation and decreased the efficiency of the locomotive. Practically all of this number had been pronounced ready for service or were actually in service with defects constituting violation of the statute and of economic law.

Comparing engine failures, one road with another, is of little value because no standard has been fixed. There is, however, no better index as to the condition of locomotives than an accurate comparison of engine failures on a given road.

This was very forcibly brought to my attention about a year ago on one particular line where we were encountering considerable difficulty in having the requirements of the law complied with. A vice-president went so far as to request that the federal inspector in that district be removed to some other district because of alleged prejudice. This vice-president requested a conference with me at which the superintendent of motive power was present, when the conditions to which exceptions had been taken were discussed in their various details. The conclusion was reached by this same vice-president, that he wanted the inspector about whom complaint had been made to stay on his line and wished that he had more inspectors on his line because they were developing and putting before the management the conditions that cause engine failures, train delays, accidents and injuries. What has been the result? During one year there were about 400 engine failures per month with an average of 3,545 miles per failure. A year later the number of engine failures per month had been reduced to about 90 and the miles per engine failure had been increased to about 15,000. This is a vivid contrast between proper and improper inspection and repair. Proper maintenance of locomotives increases the earning power of any railroad, while improper maintenance reflects itself indirectly in unnecessary expenditure.

Factors in Good Boiler Service

No locomotive is better than its boiler. Marked advances have been made in the design and construction of locomotive boilers, while the original principle is still retained, tending toward better circulation of water and better distribution of expansion strains. No matter how well constructed a boiler may be, it cannot be safely or efficiently operated without current inspections, tests, and repairs. No one disputes this but it is surprising to learn the large number of locomotives upon which defects have been reported trip after trip and day after day and still continued in service without regard to the peril created or the monetary loss indirectly incurred.

One of the first considerations in maintaining boilers is that of water supply. Those of you who are connected with the operation of locomotives in bad water districts know of the problems arising from this source, both from the maintenance view-point, and of getting over the road with a train. Too much cannot be said for the necessity of removing all washout plugs and thoroughly washing all parts of the boiler as often as water conditions require. It is too often true that boiler washing is neglected, which is always reflected by increased trouble and cost of maintenance. When sheets are coated with scale, thus insulating them from the water, the water cannot absorb the heat readily and the result is increased temperature and strain with a corresponding increase in trouble and decrease in evaporation.

Marked improvements in water supply have been made in many places by the installation of treating plants and in others by changing the source of supply. Conditions have been vastly improved, in many instances, by installing modern washout systems. These improvements cost money, but when one considers the reliability and efficiency of service that is today required of locomotives, it becomes apparent that any reasonable expenditure in providing better water and proper washing facilities is ultimately a paying proposition. There is a close and inseparable relation between locomotive maintenance and fuel economy. The increased cost of fuel has made it a matter of prime importance and is attracting the widest attention among the railroad managements at this time.

Efficiency and economy of operation has caused the application of brick arches, superheaters, combustion chambers, feed water heaters, thermic syphons, and many other appliances, which must be properly maintained if the desired results are to be accomplished. Since steam is the propelling power the problem to generate it freely and to use it economically is an all important question. To this end locomotives should be so maintained that the distribution of the steam to the cylinders be most effective, and that the machinery be in condition to utilize the energy created to the highest possible degree. Rod bearings which are loose and in bad condition, boxes loose on journals, shoes and wedges out of adjustment, loose and worn cylinder packings which blow, valves out of square and blowing, are poor mediums through which to transmit the energy; they adversely affect the drawbar pull and the earning power of the locomotive.

The Monthly Budget Not a Promoter of Stability

One of the unfortunate situations confronting the mechanical departments is the manner in which their appropriations

are made. It is my thought that an annual, instead of a monthly, budget or allotment should be made. One of the most important considerations in the matter of locomotive maintenance is to have a corps of competent, steady, reliable, and contented employees. We must have contentment if the best results are to be obtained; discord and confusion among employees is not conducive of the best results. Discontentment and confusion are bound to ensue when employment is uncertain and irregular.

There is nothing which so adversely affects economy of locomotive maintenance as to tear the mechanical organization to pieces each month or at frequent intervals in order to keep within the appropriation or to fluctuate the personnel with every temporary traffic change. I appreciate that revenues can not be disregarded when making expenditures, but, with proper consideration, forethought and foresight, expenditures can be anticipated with sufficient accuracy and the mechanical forces so regulated as to provide steady employment. Steady employment at remunerative wages brings about a satisfaction among employees that is hard to disrupt; on the other hand, when men are treated as machines and laid aside without regard to consequences, and without sound reason, it breeds bolshevism, unrest and disloyalty, and brings hardships, not only upon the men thrown out of employment, but upon everyone connected with the organization.

Again, locomotives cannot be properly and economically maintained if repairs are neglected until the rush period is on. It is then that the locomotives should be in revenue service and not in the shop; it is then that the transportation department is pressing for motive power. Therefore, in keeping with sound management the locomotives should be repaired in the dull period and be available in a high state of repair when the rush comes, if traffic is to be most efficiently and economically handled.

Locomotive Boosters—Effect on Design and Train Operations

The demand for efficiency and economy in locomotive design and service is increasing every day. Every new idea that can be worked out successfully along those lines is speedily accepted by railroad managements. Consequently when the booster idea was conceived and grew into a working model and a very successful one, it has met with most gratifying success in a short time, being used first on the New York Central in 1919.

The greatest difficulty in handling a maximum tonnage train is in getting it started as well as getting it over the grades. It is a well-known fact that the tractive effort necessary to start a train is far greater than the effort required to keep the same train in motion. It is also true that the horsepower the locomotive develops is greater while in motion than when starting from rest.

For many years enginemen have worked on this principle without success, until in 1918 H. L. Ingersoll, assistant to the president of the New York Central, developed the booster and brought it to its present high standard of efficiency. It is now considered a necessary appliance and has been placed on over 1450 locomotives on 43 different railroads in the United States and Canada, and applications have been made on locomotives on several foreign roads.

The locomotive booster is a horizontal two-cylinder double-acting steam engine mounted on the trailer truck and connected directly to the trailer axle of the locomotive through suitable gearing by which it may be engaged or disengaged at will.

It is designed for applying power to the trailer wheel in the *forward motion only*. It cannot be operated when the engine is in back motion.

It is self-contained and has a flexible mounting in the form of a three-point suspension. Bearing on the trailer axle are two of the points, while the third is the spherical seat at the center of the rear cross member of the truck frame, which latter allows free movement of the booster with the varying positions of the trailer axle.

The engine is a very simple type, consisting of two 10-in. by 12-in. cylinders with piston valves taking steam direct from the dome or from the steam chest. Steam is admitted to the cylinders three-quarters of its stroke and has no variations in cut-off.

Steam admission is controlled automatically at the will of the engineer. Exhaust steam passes through flexible connections from the booster engine to the atmosphere through the exhaust nozzle and stack.

The machinery of the booster consists of a crank-shaft driven by the booster engine which in turn drives the idle gear so placed as to mesh with another gear on the trailer axle, by means of the automatic air-operated clutch, driving the trailer axle, thereby making a temporary driving axle to assist the main driving axles in starting or exerting increased effort as needed.

When the train reaches a speed of about twelve miles per hour, the idler gear is automatically released by the reverse lever which is pulled back to reach a pre-determined point so it disengages the latch of the pilot valve, or the engineer can disengage it by knocking down the booster latch. The booster then is inoperative, in which condition it exerts no power, but is available when extra power is needed.

The purpose of the booster is to provide additional starting effort, increased power for acceleration and additional tractive effort on grades.

It can be attached to the trailer truck of the locomotives and is a reserve power that can be quickly applied when needed and as quickly released when not needed.

It can be used in starting trains and its power utilized until they reach a speed of twenty miles an hour, when it should be disengaged.

The starting power of the locomotive is governed by the weight carried on the drivers. The trailer axle usually carries as much weight as one pair of driving wheels. Various ways have been devised to utilize this idle weight of the trailer wheels and axle and divert them into driving wheels.

This is where Mr. Ingersoll's idea has been successfully developed. He realized that to apply his idea correctly certain limitations and functions must be considered, such as, the minimum amount of changes to be made on existing locomotives, not disturbing the relation between the fire-box trailer axle and the diameter of the trailing wheel, installation of the power units so that it would deliver the torque to the trailer axle without in any way affecting the action of the read end of the locomotive, obtaining additional power only at starting and low speeds, when the boiler can supply more steam than the main engine can utilize, that the power unit should normally be controlled by the engineer but should be inoperative automatically after the locomotive has attained a pre-determined speed, and that there should be no interference with the functioning of the locomotive at high speed.

The booster is an advantage in both passenger and freight service, as an aid to smoother starting and quicker acceleration which results in greater comfort to passengers, as an assistance of sufficient power to start trains under adverse circumstances and increased tonnage, it avoids taking the slack in starting trains, resulting in reduced cost of equipment maintenance, and also in many cases the use of expen-

sive helper service is eliminated. It increases the ton miles per hour per locomotive over a division.

It is of equal importance in hump and transfer service, as it assists in starting trains with less damage to equipment. Tests in yard service show there was an increase of about 15 per cent more cars handled per engine than by the same class of engine without a booster. In the ability to add increasing starting and accelerating power to existing locomotives lies the hope of lower transportation costs through more tonnage haul per unit.

Boosters now in service show an addition in starting power to the Santa Fe type of 10 per cent, the Mikado type of 23 per cent, the Pacific type of 27 per cent, and the Atlantic type of 36 per cent.

The effect of the booster on the locomotive is merely an increase of 5 per cent in static stresses, which is well within the allowance in specifications for bridges, buildings and other mechanical construction.

The increased power has decreased by almost one-half the time required to get trains to road speed. By providing the extra power needed to give a smooth, steady start, the booster locomotives avoid the necessity of taking slack, thus reducing draft gear maintenance, which is one of the largest items of freight car repairs.

The operating results that are being secured by a booster equipped Mikado over the 100 per cent tonnage rating of 23 Mikados which are not booster equipped, is as follows:

Increased tonnage ..... tons	392
Ton-miles per day	39,200
Ton-miles per 100 miles for 30 days	1,176,000
Additional monthly earnings, $.0007 per ton-mile	$8,232
Additional freight, one way only	$4,116
For one year (300 days in service)	$41,160
Revenue ton-miles compared with total ton-miles ..... per cent	67
Actual increased earnings	$27,577

The report was signed by W. H. Corbett, (M. C.), chairman; J. A. Talty, (Franklin Railway Supply Company); H. L. Symons, (D. & H.), P. H. Ryan, (I. C.), F. W. Stoll (N. Y. C.), and W. B. Smith (B. & A.).

Discussion

Practically all the members who discussed this paper indicated a favorable opinion of locomotive boosters in view of their performance to date. One of the members said that they enable the tonnage rating of freight locomotives on his road to be increased 300 tons, another member said 500 tons and still another, 1,700 tons. Presumably the difference is accountable for by local conditions and gradients on the different roads. The favorable effect of the booster in enabling passenger locomotives to start heavy trains of steel cars without taking slack was pointed out. The consensus of opinion seemed to be that the best results are secured when the booster is piped to operate on superheated rather than saturated steam and when one man is regularly assigned to care for the boosters at the enginehouse and see that they are properly oiled and maintained. The records show that approximately one quart of car oil a month and one-half to three-quarters of a pint of valve oil are used, provided there are no leaks.

James Fahey, (N. C. & St. L.) said that boosters have been tested, using a dynamometer car over a period of one year and seven months, and, in view of the satisfactory results achieved, they are now being applied to heavy power, three at a time at the enginehouses without waiting for the locomotives to go to the back shop for heavy repairs. Mr. Fahey also testified that the boosters are responsible for reduced fuel consumption, that little difficulty is encountered due to maintenance, and that in the winter trains have been found frozen, but with the boosters still operative.

While one member said that in his experience the operation of the booster for six minutes would cause a reduction in steam pressure, other testimony was to the effect that the boosters have operated in certain cases as long as one hour and seventeen minutes on a grade without causing a material reduction in steam pressure.

The only criticism developed regarding the booster was the necessity of keeping the various air pipes absolutely tight in order to keep the booster operative. One member also said that he had had a broken main rod and loose crank pins which necessitated the removal of the boosters from the trucks and required considerable work before the necessary repairs could be made. Other members on the other hand claimed to have had almost no difficulty due to the maintenance of the boosters and in one case the only work needed after 45,000 miles of service was to re-pack the piston rods.

It was pointed out that in freight service the booster should be cut in when speeds fall to 10 miles per hour in order to get the best results rather than allow the speed to get too low. In passenger service, one member said that the booster should not be cut out until a speed of from 15 to 20 miles an hour is attained as in this case the utmost advantage is taken of the booster to secure rapid acceleration. Like all other locomotive devices, the boosters can be misused and abused by enginemen who do not understand them. The advisability of getting a little sand on the track before starting the booster was brought out in the discussion. The cost of a booster applied was said to be $7,500, an amount quickly repaid by the increased earning power of the locomotive.

Stoker Fired Locomotives and the Future Engineman

The modern locomotive and the present-day train cannot be handled successfully by skill and instinct only. In addition it requires rare judgment, thought and resourcefulness. This can only be obtained through the exercise of the mental faculties, and as the exercise of the mental faculty presupposes a mind or brain, we get right back to the first proposition, that it takes brains to run a locomotive. And thus we have as the first part of our problem the fact that the engineer, to be an engineer, must have a good active brain.

The next part of our problem is: Where will we get this man? It is becoming more and more difficult to obtain the right kind of men from whom we must draw to get the future engineman. As our only source of supply is from the left side of the engine, it follows that the fireman must have brains or he cannot become an engineman.

Granted that we set out to employ a man who can think. We place him on a large hand-fired engine to learn the art of firing. When he looks back he sees from 16 to 20 tons of coal staring him in the face. On the deck he sees a large scoop, a coal pick and a clinker hook. He turns around and sees a fire-door which, when opened, pours out a stream of heat that will burn his overalls off if he gets too close, and near the door a shaker bar and a bunch of shaker levers. He is told that all he has to do is to crack the coal, throw it into the firebox, and then shake down the ashes.

He looks all around and sees men employed in gainful occupations and has a fairly accurate idea of what their wages are. He sees men building a house and visions the time when each of these, the carpenter, the bricklayer, etc., can, by proper application, become contractors. In fact, every place he looks he sees possibilities of promotion, until he looks at the fireman and then he begins to figure: "Let me see—I am twenty-one now; if promotion continues as slow as at present, I will be nearly forty before I am promoted. I wonder if the romance of the calling won't be somewhat worn off by that time—I wonder."

To hold this man on the job, we must try to get back to the old system as near as possible. True, we cannot hurry promotion; neither can we go back to the small engines, nor can we (even if we so desired) stop the march of industrial progress in those other directions that hold out possibilities to the young American, but we can make the fireman's work more attractive by making it easier. We can fire locomotives mechanically and thus relieve him of the hard manual labor and give him time to think and study to fit himself for the position he aspires to.

Do you think if a student fireman who has decided to take up railroading as a lifework, gets on a stoker-fired engine, he will quit the job after one round trip? If you do, you are not familiar with human nature. On the contrary, he will become so interested that he will not be satisfied until he masters the machine, and by that time he will see that there are other possibilities ahead of him in railroading besides running an engine, if he only applies himself; but when a man is worn out physically you can't expect much from him mentally, and the thinking man realizes this and gets off.

Going back to the beginning—if we want to maintain the high standard of enginemen that we have at present and that the service demands, we must begin with the fireman. Of course, we appreciate the fact that on all railroads there will always be hand-fired engines. The thinking man will realize this also, and so long as these engines are within the capacity of the fireman he will not let that stand in the way of his accepting service, as he can see that after his term on the hand-fired engine has been served he will get a stoker-fired engine, a job that aside from the pay is nearly as good as one on the right side. And the ultimate effect will be that the present high standard of enginemen, of which we are all justly proud, can and will be maintained, and the railroads will derive benefits through better train and engine handling far in excess of the financial outlay.

Your committee for a number of years has watched the evolution of the mechanical stoker and its increased efficient operation by the fireman. We also have noticed the increased knowledge pertaining to locomotive operation that the regular assigned stoker fireman has absorbed. In the past when we had all hand-fired engines if you asked a fireman how much coal he used on the trip, he would usually answer: "Oh, I don't know—about two tanks full." Nowadays it is different. On the road with which your chairman has the good fortune to be connected it is not unusual to get up on our stoker engines and ask the fireman: "How is the fuel consumption showing up on this engine?" He will answer right off: "Oh, about so many pounds per 1,000 gross ton-miles or per passenger car-mile." And that is not all. He will tell you whether or not the evaporation of water per pound of coal is what it should be and a good many other things that he did not know while on the hand-fired engine. He will talk to you about the air openings in the ash-pan, and why he has to carry a lighter fire on one engine and a shade heavier on another.

Now why can this fireman talk so intelligently about locomotive operation? Because with the stoker-equipped engine he has time to think and study. Let me give you one example of a fireman who had learned to think. Your chairman was operating a locomotive with 100 tons over the rated tonnage of the locomotive. In order to make a meeting point for four passenger trains, he said to the fireman: "We will run this next water station and go to K. for water." He said: "That's good, and we will have about ten inches of water in the tank when we get there." As this fireman had not looked into the tank since last taking water, I wondered how he knew just how much water would be in the tank on arrival at K. (this being an unusual run he had never before made with such a heavy train). In conversation with him he explained why he could tell without looking into the tank. He stated that he knew from the uniform maximum steam pressure, the very light fuel consumption and the quarter turn of the water valve to injector that the engine was not using much water.

The mechanically fired locomotive is quite a factor in educating the fireman not only in the economical firing of the engine, but also enables him to better observe the manner in which the engineer handles the engine. Another fact is that the stoker has a tendency to make the fireman more mechanical. He feels there is a certain amount of responsibility attached to the operation of the stoker. Therefore he gives more attention and thought to the locomotive as a whole than when on the hand-fired engine.

From a safety standpoint the mechanically fired locomotive has the advantage of two men being constantly on the lookout. Inquiry of one railroad brought out the fact that there was no record of any mechanically fired locomotive running by a block or red board. This in itself is of more value than appears on the face. One bad rear end collision will pay for any number of stokers.

The mechanically fired locomotive will in our opinion enable railroads to employ high-class young men for the position of fireman, who in time will become high-class engineers, and in the end the railroads will profit by it with increased tonnage, reduction of number of hours on the line, reduced fuel consumption and less fire-box and boiler maintenance expense. Mechanically fired locomotives make contented jobs for the engine crew, and a contented engine crew is a valuable asset to the railroad.

The report was signed by Jas. Fahey, Nashville, Chattanooga & St. Louis, chairman; F. P. Roesch, Standard Stoker Company; A. N. Wilsie, Locomotive Stoker Company; H. Von Erickson, Great Northern; W. T. Hanna; N. Shurie, and R. Hammond, New York, New Haven & Hartford.

Discussion

The discussion of this paper indicated plainly the opinion of the majority of the members that mechanical firing enables a higher grade of men to be hired for the position of firemen and consequently provides a better source from which to obtain competent enginemen. The fireman on the stoker-fired engine reaches home after a trip in such physical condition that, with sufficient ambition, he can study effectively. In addition while on the locomotive he is enabled to study the engineman's method of handling locomotives much more than formerly. An important safety feature is provided in that the fireman has time to assist in watching for signals to a much greater extent than when compelled to fire locomotives by hand.

In general, mechanical stokers are applied on locomotives of 50,000 lb. tractive effort or greater, which leaves out many of the Pacific type. The safety feature, however, may in some cases justify application of stokers to locomotives which as far as size is concerned could be hand-fired effectively.

How to Improve Oil Burning on Locomotives

There are now 45 railroads in the United States making use of oil fuel in locomotives to a greater or less extent. Last year these railroads used 57,600,000 barrels of oil valued at approximately $7,800,000.

With this widespread use of oil as fuel on our railroads, not only the most capable officers and employees of the railroads themselves but the best combustion and designing engineers in the world have devoted their best efforts in produc-

ing the modern oil-burning locomotive. To say that it is not highly efficient would be to ignore the results of thousands of tests which plainly show that it compares very favorably with the most modern central stations and that it does so under serious handicaps. But none of us is satisfied, nor do we think perfection has been reached.

How to improve the burning of oil in locomotives brings us face to face with the problem of securing complete combustion of a large amount of oil in a small space and during a very limited time. From the time a drop of oil leaves the burner tip until it is completely atomized, consumed and has reached the flue-sheet less than one second has elapsed.

There are four conditions ever present that must be met before complete combustion of oil can take place; first, the oil must be properly atomized; second, we must have the proper amount of air; third, we must have the proper temperature in the fire-box; fourth, we must have a sufficient length of time for the thorough mixing of oxygen and gases and to complete combustion before they reach the flue-sheet.

Burner

That much thought has been given to the construction and design of oil burners is shown by the fact that more than 3,000 burners have been covered by patents in some form or other; yet the few steam atomizing burners in most general use on the largest oil-burning railroads are of simple construction, have stood the test under keen competition, and some of them are now unprotected, as the original patents have long since expired.

Many attempts have been made to introduce mechanical atomizing burners on locomotives, and no one doubts but what a more complete and thoroughly atomized oil spray may be obtained through such a burner, but the chief difficulty encountered is in the range required. A 2-10-2 type locomotive under maximum working conditions consumes 550 gal. or 4,400 lb. of oil an hour. The ordinary mechanical atomizing burner will deliver 300 gal. or 2,400 lb. of oil an hour, which would mean two such burners. The problem therefore appears to be one of increasing the capacity of the mechanical atomizing burner rather than installing more than one burner.

This subject is now receiving careful study at home through a trial installation of a mechanical atomizing burner on a switching locomotive of an eastern railroad. The burner being tested is the wide-range mechanical atomizing type of the Peabody Engineering Corporation. This burner was installed October, 1923, and no difficulties have so far been encountered in maintaining maximum steam pressure; neither is it necessary to clean soot from flues, as the oil is so completely consumed that no soot is deposited.

A very interesting experiment with mechanical atomizing burners on locomotives was conducted recently on one of the large French railroads. These tests were highly satisfactory and they now have 37 locomotives so equipped. One burner is capable of taking care of a French locomotive, but their power is somewhat smaller than ours. This burner is the Whitehead Ray rotary type, an American product. A dependable supply of oil for locomotive use is at present an unsolved problem with the French railroads.

That possibilities exist through application of mechanical atomizing burners for economy in the amount of steam used for atomization (the ordinary steam atomizer-burner uses from 2 per cent to 4 per cent of the total output of steam) and for reducing the amount of fuel that is required by improving combustion, no one doubts, but there are some difficulties yet to be surmounted.

Steam is the spraying agent now in use to atomize oil, although certain people recommend the use of air. If you should experiment with air for atomizing, don't rob the compressor, for 100-car trains are the prevailing style and they keep the air pump fairly busy. From a mechanical point of view a cubic foot of compressed air would break up as much oil as a cubic foot of steam if both were at the same pressure. But taking the mechanical efficiency of the air compressor into account, a cubic foot of compressed air costs nearly twice as much as a cubic foot of steam at the same pressure. What is desired is that oil should be at the highest practicable temperature as close as possible to the burner tip. The use of compressed air as an atomizing agent tends to lower the temperature at the burner tip, while the use of steam as an atomizing agent tends to raise the temperature at the burner tip. It should be noted that this increased temperature is accomplished in two ways: First, by heat transfer due to coming in contact with steam, and, second, by absorbing heat given off by steam during sudden expansion. The dryer the steam used for atomizing the oil the better the results. Superheated steam therefore has the preference.

Burner Location

The standard location of the burner is in the front of the fire-box below the flue-sheet, the oil being sprayed toward the back end of the fire-box, where the flash-wall is located to deflect the flame, which then turns and travels again about the full length of the fire-box to the flue-sheet. This location was adopted after numerous tests with the burner in the back end of the fire-box, also with two burners, one in the front end and one in the back end of the fire-box. Of the mechanical burners mentioned above the one being tested on a switch engine is in the back end of the fire-box, while those on French locomotives are in the front end in the same location as our burners.

If it were possible to reduce the distance between the burner tip and the point of ignition, a much longer time would be allowed to complete combustion, the gases would have more time to give off their heat and the advantage of longer flame travel would be obtained.

Pyrometer tests show that the temperature of hot gases entering the tubes drops to about 1,300 or 1,400 deg. F. within 18 in. after coming in contact with evaporating surfaces, which is about the lowest temperature at which complete combustion takes place. Where combustion is not completed by the time the burning gases enter the tubes it is a known fact that they are chilled below the igniting point and deposit carbon on the tubes in the form of soot.

A series of tests were made in the fall of 1919 and the present standard of front end burner without an arch or arch tubes was found to be the best arrangement and produced the highest efficiency.

During the past few months a test has been in progress with thermic syphons on 2-10-2 type locomotives with front end burners to determine if any economies are possible from their use, and since these syphons are in the same relative position as arches or arch tubes it revives interest in the subject and makes one wonder if there would not be a possible field for some economy from further tests with arches in view of the fact they are part of the standard equipment on coal-burning locomotives. Three factors were against the use of arches in the tests previously conducted, namely difficulty in connection with maintenance of arch and arch tubes and the expense and trouble caused by pieces of broken brick falling down in the path of the flame, sometimes causing engine failures, difficulty in sanding flues, especially the lower ones which were behind the arch, and the impingement of flame against the crown-sheet where the arch ended. With the advent of larger power and combustion chambers in fire-boxes we are confronted with somewhat different conditions. Have not the arches been improved through stronger construction and the use of better brick and other material? Will not the mechanical steam soot blower enable us to reach all the flues? The third feature of impingement is not so easy to overcome and may prove the stumbling

block, although improvements in combustion through the mechanical burner may help out in some measure.

Air Openings

The proper location and the correct size of air openings in the fire-pan are of utmost importance. A safe rule is for air openings to be seven times the area of the cylinder. Sufficient air should be admitted around the burner to prevent it from becoming overheated. Too much air admitted around or under the burner unless proper damper control is provided may result in chilling the lower flues, as the air takes the line of least resistance and goes up the front brick wall and into these flues on its way to the stack. Leaky flues are often the result.

Admitting the major portion of air to the fire-box through a flash-hole varying in size from 8 in. by 10 in. to 13 in. by 20 in. and located from 9 in. to 18 in. in front of the flash-wall and a 2-in. by 35-in. opening in the hooded fire-door is one practice on Southern Pacific Lines. The air openings are approximately as follows: Flash-hole 25 per cent, burner openings, 5 per cent, door damper 5 per cent of the minimum area of tubes allowing for units. This is what is known as the vertical draft having the hooded door as against a solid door with a 5-in. circular opening used in sanding flues.

The horizontal draft differs slightly in that it admits the air through small openings in the front of fire-pan around the burner and through the hooded door. Each of these methods are in general use on the Southern Pacific.

The draft-pan opening or flash-hole is also used by other oil-burning roads, but they also have a number of round openings along the side of the fire-pan over which an adjustable slide may be drawn by lever control from the cab to regulate the amount of air.

It is well known that an appreciable amount of heat is lost through radiation from the outside of the boiler, losses being greatest from the outside side-sheets of the fire-box. Engineers today are recognizing the fact that pre-heating the air means fuel economy. It may be possible to use at least part of the heat now lost through radiation for pre-heating air to the fire-box. How this can be done is a matter for development, possibly through the use of easily removable ventilating air ducts attached to the outside of the boiler, conveying the heated air to the present air intakes to the fire-box.

Dampers

The device which regulates the amount of air entering the fire-box plays no small part in maintenance cost and fuel economy. The usual damper control is by rod or chain connection from the cab. On the French locomotives mentioned above a worm gear control on the rod connection from the cab is now in use and gives very accurate adjustment of the damper.

At the present time there are two styles of balanced dampers being tested on the Southern Pacific, one is a butterfly damper enclosed in an air chute at the front end of the fire-pan and the other is a flapper damper which hangs in closed position over the front end of the fire-pan and is opened by draft when the engine is exhausting. Both are meeting with success, but neither has been in use long enough to pass judgment as to which is better.

The dampers on an oil-burning locomotive are in a location where inspection and maintenance are difficult, which should lead us to perfect a damper which will require the minimum of attention and yet be always serviceable.

Furnace Design

Heating surface of the fire-box is worth five times as much per square foot for evaporative purposes as that of the tubes.

Anthracite coal is burned on the grate. As air is passed through the bed of coal the oxygen and carbon unite, mechanically forming complete combustion within the bed of coals. With bituminous coal the oxygen unites with the fixed carbon as with anthracite coal, forming complete combustion within the bed of coals, but the volatile part of the coal is driven off and must find its oxygen and sufficient temperature to complete combustion in the furnace space above the bed of coals. For practical purposes fuel oil is a 100 per cent volatile coal, because the entire body of oil is sprayed and burned in the furnace space. From the above it is apparent that the greater the percentage of volatile matter the greater the furnace volume required. Therefore fuel oil or gas requires greater furnace volume than any other kind of fuel. When coal is burned the radiant heat from the bed of coals ignites the gases over the bed of coals. With fuel oil there is no bed of coals, therefore sufficient refractory surface must be installed in the fire-box to take the place of the bed of coals and furnish sufficient radiant heat to maintain temperatures high enough to complete combustion. Where there is not sufficient refractory surfaces or where the refractory surface is poorly located, drumming will result.

Refractories

Of utmost importance is the placement of fire-brick or refractory linings themselves, both from an economic point of view in maintenance of refractory linings, as well as their ability to properly direct the flame and best protect the exposed sheets.

In the use of fire-brick of standard size (2½ in. by 4½ in. by 9 in.) it is always best to place the brick with edge or end exposed to the flame. The flash-wall and all bricks upon the shelf of the pan should be placed in this manner.

A late practice in the placement of bricks next to side-sheets, which is proving advantageous in the protection of the sheets next to the mud-ring, is to make the height approximately 18 in. from the shelf of the pan, or four rows of brick 4½ in. high. In so doing the surface of the sheet is covered higher. Tests to date on the same locomotives equipped with brick 9 in. above the mud-ring show no difference in fuel economy over a period of more than six months, but do show materially less deterioration of the sheet at the mud-ring end. In support of this is the fact that the mud-ring is a dead end and a settling space for sediment, as its name implies, and being a settling chamber should be treated as such and protected by carrying the refractory higher than has heretofore been the practice.

Some oil-burning authorities never sacrifice a square foot of heating surface in the fire-box wherever possible to secure it, whereas the supporters of carrying the refractory high on the side-sheets claim that the heating surface closely adjacent to the mud-ring is of little value. One thing is certain by the new arrangement, and that is, that engines will not be in the back shop as often by far for new side-sheets with the high refractory setting.

Front End

There has been considerable speculation as to the removal of baffle-plates from superheated locomotives using oil as fuel. One road reports no apparent deterioration of superheater elements, although the baffle-plates were removed from these oil-burning locomotives two years ago. It is the purpose of these baffle-plates to prevent gases from passing through the superheater flues while the engines are being fired up and standing and also to give a more equal distribution of the gases between the upper and lower portions of the evaporating surface and superheating surface. With the baffle-plates removed the natural tendency is for the gases to flow through the top flues where less restriction is offered. On some of the engines which have had the baffle-plates removed a longer downward extension stack has been applied, which in a measure helps to baffle gases passing

through the top flues, creating a condition similar to that where baffle-plates were in use. With baffle-plates removed it is much easier to keep the flues clean, as they take sand more readily. It is also easier to fire up engines without forcing and making black smoke. It also means one less item of maintenance. It is no doubt a fact that the removal of baffle-plates from oil-burning locomotives would be more advantageous and that less damage would occur to the superheater elements than on a coal burner.

The report was signed by J. N. Clark, Southern Pacific.

Discussion

In discussion of the paper on oil burning, one member said that he had tried eight different types of burners and that only 5 per cent difference in fuel consumption between the best and the poorest could be discerned. This was in a test of 2,400 miles for each burner. The location, method of connection and height of the burner have an important bearing on oil consumption, however. The consensus of opinion was that the burner should be located from five to eight inches above the floor of the fire pan, the prime essential being the placement of the burner so that the flame is directed properly. A space of approximately five feet should be allowed from the burner to the flash wall for the most desirable results.

There was a difference of opinion regarding the value of side walls, one road keeping the walls at a height of 18 in. above the mud-ring and another having only one row of brick above the mud-ring. One member said that excess air is more responsible for cracked sheets owing to contraction than the action of the flames. The general sentiment seemed to be in favor of the baffle doors as admitting air to the fire-box at the proper point. The use of front end superheater dampers on oil fired locomotives was generally considered unnecessary. The members again expressed themselves strongly regarding the need of attention to air openings in the ash pans. The presence of a brown haze coming from the stack was mentioned as a reliable indication of complete combustion without too great an excess of air.

Lubrication and its Effect on Locomotive Service

Since lubrication has for its object both the reduction of friction and the prevention of excessive development of heat, the value of the lubricant depends on its efficiency in reducing friction, its durability under wear, its freedom from liability to "gum," its freedom from acid and grit, its permanence of composition and its physical condition when subject to changes of temperature. It is of great importance to remember that the higher the temperature the less is the lubricating power of any lubricant; and consequently if we have an efficient lubricant under normal conditions, it should not be assumed that a hot bearing may be cooled by increasing the quantity of lubricants on it, but the cause of the bearing heating should be removed, and time and money saved.

It is long since an acknowledged fact that vegetable oil and animal fats are inferior to properly refined petroleum oil for machinery lubrication. Nearly all vegetable and animal oils are compounds of glycerine with fatty acids, and in this respect essentially differ from the mineral oils. When kept for a long period decomposition takes place, acid is set free, and the oil becomes rancid. This rancid oil will attack and injure machinery.

Value of Specific Gravity and Viscosity Tests Questioned

A prominent writer in his book on "Lubricants, Oils and Greases," says: "The tests that usually influence the choice or purchase of lubricating oils are the specific gravity and viscosity; but in reality these tests count for little, for the reason that but a small idea of the lubricating quality of an oil can be gained from either of the tests separately, and not very much even when taken conjointly, except in extreme cases; as, for instance, we know that a very thin, light oil is useless for steam cylinder and heavy journal lubrication, and that a thick heavy oil is equally useless for light, high-speed spindles."

Many consumers of large quantities of lubricating oil, particularly large railway systems, are provided with laboratory facilities, both chemical and physical, and it not infrequently happens that those in charge of these laboratories feel that the department is not entirely fulfilling its purpose if it does not exercise a certain supervision over the purchase of lubricating oils; making very rigid requirements for the flash, burning, viscosity and gravity tests, assuming when the oils meet these requirements that they have fine lubricating qualities; when, as a matter of fact, oils having much better lubricating qualities may be barred by the very requirements intended to serve as a means for getting the best, the requirements thus defeating the very purpose they were intended to serve. Prof. Thurston in his book on "Friction and Lost Work in Machinery," states in this connection: "The consumer will usually find it economical to use that lubricant which he has found to be the best, with little regard to price, and often finds real economy in using the better material, gaining enough to pay excess in the total cost very many times over."

Cylinder Oil Must Be Atomized

The best service from a valve or cylinder oil requires that it enter the steam chest thoroughly atomized, each drop being divided into thousands of minute drops or atoms as it reaches the rubbing surfaces. This is accomplished by a combination process of emulsification, vaporization and atomization and it follows that a first-class cylinder oil must possess the qualities to readily emulsify and atomize, with a sufficient degree of vaporization to spread itself over the surface with the steam, in other words, to lubricate the steam. Uniformity of distribution is as important as the uniformity of supply. These are principles that apply to valve and cylinder lubrication, irrespective of type of valve or temperature of steam.

With the use of the hydrostatic lubricator, the oil is not forced into the steam chest, but is entirely dependent upon the force of gravity to carry it there. This depends upon gravity for perfect operation and the fact that the gravitative force only acts upon the oil when the steam pressure is uniform throughout the entire length of the lubricator pipes, is probably the greatest imperfection of the hydrostatic lubricator; but its reliability in other respects and its ease of maintenance so preponderates this fault that it is commended as the most acceptable device for the purpose.

The engineman of experience has learned that it is necessary when working his engine under certain conditions with full throttle to occasionally ease up on the throttle to permit the steam pressure in the lubricator pipe to equalize, otherwise the pressure becomes greatest at the steam chest end of the pipes, and the material in the pipes ceases to flow downward, thus interfering with proper lubrication. When the engineman is unacquainted with the existence of this condition, he often wrongly assumes that the lubricator is not feeding enough oil when his engine begins to indicate improper lubrication.

The important thing to remember in the operation of the locomotive using superheated steam is that the lubricant does not flash or burn in an atmosphere of steam, even though it be 1,000 deg. F.; therefore if care be exercised to maintain an atmosphere of steam in the steam chests and cylinders there will be no carbonization of a proper lubricant. Those railway officers having had the longest and most extensive experience in operating the superheat locomotives require these engines to be equipped with some form of auxiliary or drifting throttle to be opened when the main throttle is closed while the engine is drifting.

Direct Feed to the Cylinders Unnecessary

Experience has taught the unprejudiced that the direct cylinder feed is not only unnecessary, but that better results are actually obtained without it. Much of the accumulation in the cylinders and deposit on the cylinder walls of these engines is undoubtedly due to too much oil, and this has been found to be the case mostly with engines equipped with the lubricator pipes connected direct to the cylinders.

The advancement in the lubrication of the external parts of the locomotive has probably not been so great as with valves and cylinders, yet a marked improvement has been effected, both in the interest of efficiency and economy, by the substitution of mineral for vegetable and animal oils for this purpose.

The popular argument in favor of the use of grease on driving journals, is that the bearings require less care and attention than when lubricated with oil. The influence of this argument has been rather far reaching in its effect upon the conditions surrounding the lubrication and maintenance of the most important bearing on the locomotive, with the result that too little care is used in the proper preparation and maintenance of main journals and bearings.

Care Needed in Applying Grease to Driving Boxes

To get the best results from the use of grease in driving boxes, the brasses should be made of good bearing metal, homogeneous and free from all imperfections incident to poor foundry work; they should be bored to proper diameter and given a reasonably good fit, using the same care in all respects as for oil lubricated bearings. The perforated screen of the grease cellar must be made to conform exactly to the diameter and have a full bearing against the journal over its entire surface; otherwise the grease does not feed properly and becomes carbonized resulting in a hot box. The grease cake should be machine pressed to fit the cellar and not allowed to get too thin before it is renewed. Driving journal lubrication is too important a feature in locomotive operation to relegate to the ignorant and irresponsible.

Running locomotives at high speed that have been designed to pull heavy loads at low speeds, is one of the most common causes of heating of locomotive journals. A locomotive with 54-in. driving wheels, 10-in. journals, and a 30-in. piston stroke, running 45 miles an hour has a piston speed of 1,400 ft. per min. and the speed of the surface of the driving journal is 12 ft. per sec., the speed of both the piston and driving journals being twice what it should be.

The adoption of types of valve gear, other than the Stevenson link motion, the rubbing parts of which are more accessible and less liable to heat, has assisted much towards more effective and economical lubrication of these parts.

Friction and Temperature Tests with Different Oils

Friction represents work and therefore heat must be generated, but it must not be assumed that bearings running at the lowest observed temperatures are giving corresponding low coefficients of friction, as some lubricants have the properties of carrying off heat which is not observed, and thereby showing lower temperatures than some other lubricants but showing a higher coefficient.

To prove this, tests have been made with the following results: With a journal velocity of 306 ft. per min. and a load of 350 lb. per square in.

With A oil, temperature 103 deg. F., coefficient of friction .0023.

With B oil, temperature 110 deg. F., coefficient friction .0018.

With D oil, temperature 130 deg. F., coefficient friction .0035.

This shows that the B oil ran with 28 per cent less friction than the A oil, although the temperature was 7 deg. higher, and shows that observed temperature does not always indicate the efficiency of a lubricant.

There is another feature of friction that is very important, especially in locomotive service, and that is the coefficient on the start; some lubricants show a very great advantage over others in this respect, as the results of the following tests show.

The test equipment was the same as that mentioned above and the starting or static coefficient of friction was as follows:

With A oil, coefficient at start .0034.

With B oil, coefficient at start .0026.

With C oil, coefficient at start .005.

With D oil, coefficient at start .007.

The B oil is shown far superior to the others, having an efficiency of 30 per cent over the A oil and 170 per cent over the D oil. This is caused by the B oil having superior adhesion qualities at running temperatures, so that it does not drain off the journal readily when at rest, and also having superior body it is not readily squeezed out of the load when at rest.

Serious Results of Poor Lubrication

The effect of non-efficient lubrication on locomotive service may be divided as follows: The power losses due to the friction of the various parts; the loss of metal due to wear; the various losses of time and material due to heated bearings; the reduced tonnage and increased coal consumption and delay due to pistons and valves blowing; the time when engines are held out of service for repairs, and the expense of labor doing repairs.

The first item or power losses due to friction is in general not given much study or consideration in locomotive service, on account of it being a hidden loss and also sometimes from the opinion that it cannot be in any way controlled, or that perhaps any friction reduction that could be made would not cause much benefit.

1 to 1.2 Per Cent of Fuel Overcomes Friction

Circular No. 8 issued by the Experimental Engineering Department of the University of Illinois shows from tests that 1 per cent to 1.2 per cent of the total coal fired is used to overcome the friction of a locomotive. These figures were also used by the Fuel Conservation Committee during Federal control of railroads.

This apparent low percentage of fuel consumption has led some to regard locomotive friction as not being a very important factor; but it must be remembered that only about 6 per cent of the total coal fired is available, so that the friction is approximately one-seventh of the developed power. It is quite apparent then that for each ¼ per cent that the locomotive friction is reduced that the effective work at the draw-bar is increased 4 per cent, which clearly demonstrates the importance of friction.

Applied to each 1,000 lb. of coal fired: 40 per cent or 400 lb. is lost in gases, cinders, etc., 52 per cent or 520 lb. is lost in exhaust, etc., and 8 per cent or 80 lb. available for power. Then of these 80 pounds 14 per cent is used to overcome friction and 86 per cent of it is available at the draw-bar. The friction then represents 11.2 pounds or 1.12 per

cent of the total coal fired. The draw-bar power then represents 68.80 pounds or 6.88 per cent of the total coal fired.

To apply the effects of lubrication to the foregoing, let us assume that the above was based on the performance of the B oil mentioned previously, and then if the A and D oils were used, the following would be the results:

	Pounds coal for friction	Per cent of total coal fired	Pounds coal for draw-bar	Per cent of total coal fired	Friction in per cent of draw-bar
Using B oil	11.2	1.12	68.8	6.88	16
Using A oil	14.33	1.43	65.66	6.56	21
Using D oil	21.72	2.17	58.27	5.82	37

Some reduction is necessary to all these percentages to make them exactly correct, because the percentage of friction is not all due to lubricated areas, but the differentials would be the same, so for a comparative statement they are correct and show clearly the important effect of lubrication on locomotive service.

Driving journals of locomotives are responsible for a large percentage of friction, and tests have shown that it is an easy matter to supply a lubricant that will reduce these temperatures, but it has been demonstrated that such lubricants will not stand up when the driving journals are subjected to unusual loads, such as unequalized spring gear, or wedges sticking, etc., so that it is necessary to pay some penalty in friction to insure against mechanical defects which occur frequently.

Lubrication Semi-Automatic

The lubrication of a locomotive is a semi-automatic mechanical operation that cannot be forced, and no journal can be compelled to take up a greater oil film than its speed and weight and class of lubricant requires, and on reciprocating parts, such as pistons, tests have shown that after a proper oil film is formed any further amount will not reduce friction. A piston ring lubrication test demonstrated this fact. With the ring unlubricated the coefficient of friction was about 7½ per cent; with an oil feed of one drop in two minutes the coefficient was about 5 per cent; with one drop per minute it was about 3 per cent; and a feed of two drops per minute reduce the friction to 1 per cent.

No volume of oil supplied would reduce it below this point.

The locomotive, like any other steam-driven unit, depends greatly for its efficiency on the proper distribution of steam, and its efficiency is low at the best, so that even a small leakage of the valves or pistons is a costly matter in both power and fuel losses.

Railroads in general have no record or knowledge of the separate cost of repairs of lubricated parts, or the cost due to heated bearings, or the frictional load losses, and most roads could use an oil that was 25 per cent below par as a lubricant and so long as it did not cause an unusual number of heated bearings they would not know of its inefficiency with respect to frictional load or frictional wear.

Heated bearings are costly on cars, but they are more so on locomotives, as a car can be set out without much delay, while a locomotive has to come through with its corresponding delay to crews and business. Piston and valve blows also develop on the line, causing the locomotive to be handled perhaps a hundred miles with reduced tonnage, fuel losses and delays.

If even the frictional load costs of the various lubricants were fully known, it would show that only lubricants of the highest class are suitable for efficient locomotive service irrespective of the cost of the lubricant.

Factors in More Economical Lubrication

The improvements in the parts of the locomotive; improved oil houses, equipped with adequate storage tanks and self-measuring devices; improved methods of saturating the waste packing and removing the surplus oil in a room kept at proper temperature; the reclamation and re-use of grease; the reclamation and renovation of old waste packing by putting it through a hot oil bath; the proper preparation of grease into forms for driving journal lubrication and into candles and discs for crank pin lubrication; and above all the daily attention given the subject by railway officers and subordinates, combined with the greatest of all essentials in the economical use of anything—proper accounting and comparative statements—have all been important factors in bringing about an economy in locomotive lubrication that has not only awakened the wonder of all acquainted with it, but has aroused such an interest in the minds of railroad officers that they have applied the same methods for economy to other departments with the result that it is impossible to estimate the total saving that has resulted directly and indirectly from these methods.

Notwithstanding some opinions to the contrary, the economical lubrication of the locomotive inevitably means efficient lubrication, for the reason that a more than sufficient oil not only encourages a wasteful and careless application, but also fosters a thoughtless and irresponsible attitude towards locomotive operation and maintenance; while a supply which has been intelligently determined as sufficient tends towards careful use of lubricant and careful operation and maintenance.

The report was signed by W. J. Fee, Canadian National, Chairman; D. L. Eubank, Galena Signal Oil Company; James Fahey, Nashville, Chattanooga & St. Louis; J. A. Cooper, Erie; C. McNair, Galena Signal Oil Company; L. Ernest, Minneapolis, St. Paul & Sault Ste. Marie, and E. A. Lacy, Buffalo & Susquehanna.

Discussion

An interesting discussion followed the reading of this paper on lubrication. Several of the members expressed opposition to the guaranteed mileage method of purchasing oils followed by some railroads. They said that it was just as reasonable to give an engine crew a certain definite amount of coal and of water and tell them that they must get to a certain point with that amount. In reply W. F. Walsh (Galena Signal Oil Company) said that on a certain road during the period from 1892 to 1915 the cost of lubricating oil per thousand locomotive miles increased 18 per cent under a guaranteed mileage contract, the average tractive force during the same period increasing 69 per cent. From 1915 to 1922, inclusive, on the other hand, this railroad purchased lubricating oil on the open market on a gallonage basis and the increase in cost per thousand locomotive miles was 126 per cent, the average tractive force during that period increasing only 22 per cent. Mr. Walsh said that guaranteed mileage is but the application of the normal railroad budget system to the purchase of oil. If enginemen have difficulty in lubricating locomotives with a fixed amount of oil the trouble is with their allotment and not with the system.

Comment by Mr. Von Bergen

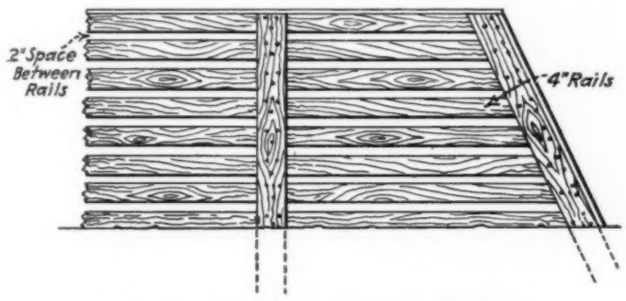
E. Von Bergen (I. C.), commented favorably on the paper and said that it plainly represented a great amount of work. He agreed that little dependence could be placed on viscosity and specific gravity as a measure of the value of lubricating oil, stating that service tests were the only reliable criterion. While agreeing with the majority of the points brought out in the paper, Mr. Von Bergen decidedly opposed the elimination of the lubricating oil leads to the cylinders. The Illinois Central practice is to feed at least as much oil to the cylinders, and usually more, than to the valves. Experience has shown that, when drifting valves are used, oil can be fed to the cylinders, omitting the leads to the valve chambers, and yet obtain desirable results in valve and piston packings life and the absence of undue carbonization.

With only a definite, limited amount of oil to make a trip one of the members said that the prudent engineer will frequently be over-cautious in the use of the oil in order not to run out of it before the trip is completed. As a result, the rate of feed may be insufficient to lubricate the cylinders properly with resultant serious wear of piston and valve packing, bull rings, bushings, etc. It should not be expected that the results secured in lubrication tests can be approximated to nearer than 75 per cent by enginemen under normal running conditions owing to the fact that they have a great many things on their minds and cannot devote their whole attention to the amount of oil used.

It was also suggested that in view of the fact that the railroads pay approximately three times as much for driving box and pin grease annually as for oil the importance of grease has to some extent been overlooked.

A Five-fold Highway Crossing Warning

At Cool Springs, Del., at either side of the crossing of the Pennsylvania Railroad, the highway department of the State of Delaware has erected in the highway a combination sign-warning and a partial barrier,



Highway Obstacle for Crossing Approach

designed to induce caution on the part of automobile drivers, which constitutes an interesting combination.

This combination sign and barrier is fixed 75 ft. from the track and there is a duplicate on the other side of the railroad to warn road traffic moving in the opposite direction. As shown by the half-tone illustration, the main features of the device are the regulation crossing sign, LOOK OUT FOR THE LOCOMOTIVE, set in the middle of the road, and a substantial barrier extending 12 ft. athwart the highway. The barrier is about 4 ft. high and consists of boards 4 in. wide fastened to wooden posts. The structure is fixed in a vertical position, like a fence, the appearance of an inclined plane, up which an automobile could be driven, being produced by the black and white stripes put on by the painter. The appearance of this barrier before being painted is illustrated in the smaller engraving.

The roadway is widened to provide space for the barrier and the carriageway, of concrete, is 10-ft. wide on either side.

For the protection of night drivers there is a flashing acetylene light, as shown. This flashes 45 times a minute. Below the flashing light is a rectangular red mirror which reflects the lights of approaching automobiles at night. Thus there are five different warnings; (1) the bend in the road; (2) the flashing light; (3) the red reflector; (4) the standard crossing signal at the top, and (5) the black and white lattice work.

The 12 ft. panel of board fence is 8 ft. 5 in. long at the top. It consists of eight 1 in. boards, 4 in. wide, spaced 2 in. apart, and held together at the center and two ends by two pieces of plank. The boards are held apart by 2 in. spacing blocks and there is a 1 in. by 5 in. facing strip on each end and a 5 in. by 1 in. cap piece on the top. The plank which holds the fence together at the ends and middle is carried into the ground about 2 ft. in lieu of posts.

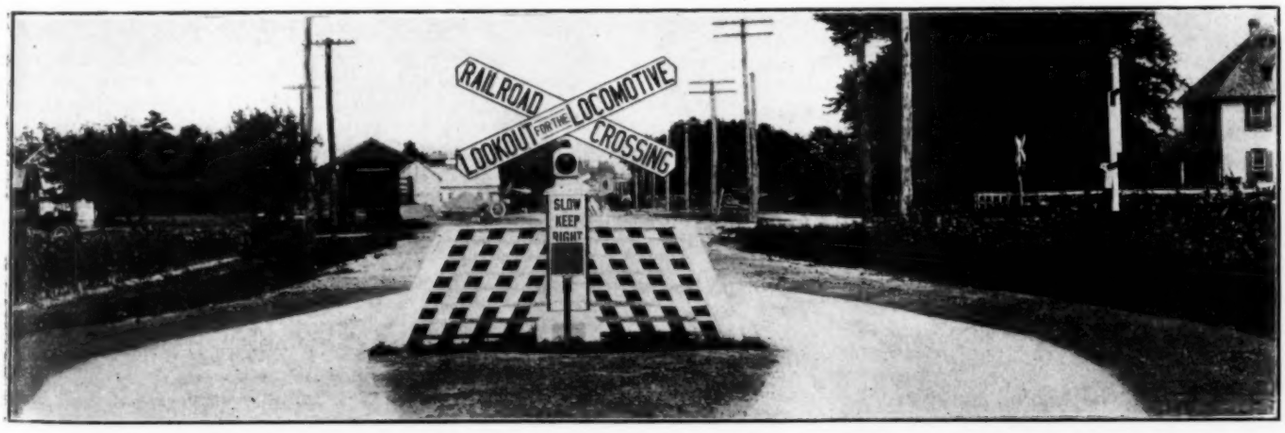
This method of construction was carried out with the view of making this fence strong enough to withstand any ordinary pressure, such as wind, but at the same time frail enough not to wreck an automobile which might accidently strike it.

Cool Spring is 32 miles east of Georgetown on the Delaware, Maryland & Virginia, which is operated as a branch of the Delaware division of the Pennsylvania System, connecting at Harrington, Del., on the main line of the division, 17 miles south of Dover.

A device similar to this has been in use in Nebraska on the Chicago & North Western. The committee on grade crossing protection of the American Railway Association has been endeavoring to secure the placing of at least one of these warnings in each of the eastern states. This one, we are informed, is the first to be put up.

This "station," as it is called, has been constructed by the co-operation of C. D. Buck, engineer of construction of the Delaware Highway Department and I. B. Sinclair, superintendent of the railroad.

Plans are under way for the erection for one of these stations at another point in Delaware.



Highway Crossing Warning at Cool Spring, Delaware, on the Delaware Division of the Pennsylvania Railroad

General News Department

C. A. Dean, who was in charge of the American team at the Olympic games held in Paris, this year has accepted the appointment as chief referee of the Chicago, Rock Island & Pacific anniversary athletic tournament, which will be held at Calumet Park, Chicago, on October 11.

The Interstate Commerce Commission has granted the petition of the Baltimore & Ohio for a modification of the train control order of January 14, 1924, so as to permit it to install automatic train control upon the passenger division between Baltimore, Md., and Philadelphia, Pa., in lieu of the installation required in the order.

The Pennsylvania Railroad Club was organized on September 16 at Indianapolis, Ind., to promote fellowship among employees of the Indianapolis division. The membership takes in all classes from gang foremen to the highest operating officers The organization work has been under the direction of Paul A. Kriese, safety agent and publicity manager of the road. The club will meet once each month.

The Safety Section of the American Railway Association proposes to have a Code of Safety Rules; and the Committee of Direction has appointed the following committee to submit a draft:—F. M. Metcalfe, superintendent of safety, Northern Pacific; H. A. Adams, assistant to general manager, Union Pacific; J. A. McNally, inspector, Wabash; M. McKernan, superintendent of safety, Missouri Pacific and W. H. Elliott, signal engineer, New York Central (Eastern lines).

D. W. Helt, was re-elected grand president of the Brotherhood of Railroad Signalmen at the annual convention at St. Louis, on September 11, 12 and 13. D. C. Cone, C. D. Martin, L. W. Givan and L. B. Smith were elected grand vice-presidents. A series of resolutions were adopted included an endorsement of the candidates of Robert M. LaFollette and Burton K. Wheeler for president and vice-president of the United States, a resolution favoring the passage of the Howell-Barkley railway labor bill and one condemning the extensive use of injunctions in labor disputes.

International Railway Congress to Meet in London on June 22, 1925

Word has been received to the effect that the next meeting of the International Railway Congress will convene in London on June 22, 1925. It is understood, but not officially confirmed, that at the same time the British railways will celebrate the centennial of railways in that country. The program for the congress has not yet been announced.

Correction

The statement published in the *Railway Age* of September 6 to the effect that the Canadian Pacific announces that it will carry lumber from Vancouver Island to Illinois, Wisconsin, Ohio and Minnesota at the same rates as are in effect from Seattle and that the lumber will be carried by the Canadian Pacific to Minneapolis, Minn., and then over the Chicago, Milwaukee & St. Paul is incorrect in that the new rates relate to shipments from Vancouver rather than from Vancouver Island. Lumber from points on Vancouver Island takes arbitraries over the rates from Vancouver. These rates are not only effective via the Chicago, Milwaukee & St. Paul but apply to other connecting lines as well.

Railway Fire Protection Association

The Railway Fire Protection Association, George R. Hurd (I. C.) president, will hold its annual meeting at the Jefferson Hotel, Richmond, Va., on Tuesday, Wednesday and Thursday, October 21, 22 and 23. The program calls for addresses by Franklin H. Wentworth and C. W. Galloway on Tuesday forenoon and one by Ira G. Hoagland on Wednesday afternoon. On Wednesday morning there will be a general discussion on fire prevention, directed by J. R. Peters.

Aside from the foregoing, the principal business of the convention will be based on the reports of ten committees, as follows: Publicity, W. F. Hickey, chairman; Statistics, J. H. Yelton, chairman; Forms, W. C. Neely, chairman; Storage of Records, A. D. Brooks; Fire Alarm Signaling Systems, deWitt Rapalje; Hand Book, T. E. Chapman; Timber Treating Plants, G. S. Giles; Revision of Fuel Oil Report, 1919, E. J. Tallichet; Grain Fumigation, J. T. Pratt; Fuel Oil on Water (around docks), W. F. Steffens.

Annual Meeting of Equipment Manufacturers

At the annual meeting of the Railway Equipment Manufacturer's Association, presided over by R. J. Himmelright (American Arch Company), it was voted that space for exhibitors next year be sold by the square foot instead of all spaces being the same size as in former years. Presentation of gifts expressing appreciation of the members was made to R. J. Himmelright, retiring president, and W. O. Thompson, honorary member of the executive committee. A gold watch chain was presented to E. J. Fuller, chairman of the enrollment committee and A. Poole, assistant chairman of the enrollment committee as a token of thanks for their work. The officers were elected for the ensuing year as follows: President, J. W. Fogg, American Bolt Corporation, Boss Nut Division; vice-president, H. A. Varney, Sunbeam Electric Manufacturing Company; secretary, Joseph Sinkler, Pilot Packing Company; treasurer, Leslie R. Pyle, Locomotive Firebox Company; and assistant secretary, F. W. Venton, Crane Company. The members of the executive committee were elected as follows: W. M. Sleet, Westinghouse Air Brake Company; R. R. Porterfield, Superheater Company; J. T. Luscombe, United States Metallic Packing Company; J. J. Cizek, Leslie Company; and J. F. Gettrust, Ashton Valve Company.

Conductors and Brakemen Ask Increase

The Brotherhood of Railroad Trainmen and the Order of Railway Conductors have submitted to the Railroad Labor Board a request for wage increases of from 4½ to 5 per cent, on eleven railways which were not parties to the agreements made last summer in direct negotiations between managements and the brotherhoods in Chicago and New York. These roads are the Bangor & Aroostook, the Chicago & Alton, the Chicago, Indianapolis & Louisville, the Cincinnati, Indianapolis & Western, the Denver & Rio Grande Western, the Detroit & Mackinac, the Green Bay & Western, the Kansas City, Mexico & Orient, the Midland Valley, the Minnesota, Dakota & Western and the New Orleans Public Belt. The increases asked by the trainmen are approximately the same as those granted by most of the roads last summer. Since the roads that have already negotiated agreements with the trainmen secured changes in working rules in return for the wage advances, it is probable that the 11 companies now involved before the Labor Board will request similar rule changes.

Board Orders Election on P. R. R.

The hearing before the Railroad Labor Board on the controversy between the Pennsylvania and its telegraphers was suddenly terminated on September 22 when the board ordered that an election of representatives of the employees be held under its direction. The board did not set a date for the election.

The dispute arose as a result of the refusal of the telegraph department employees to consent to the appointment of a joint committee of the telegraphers and the management to rule upon the request of the employees for wage increases. The Order of Railroad Telegraphers then injected itself into the controversy with the demand that it be recognized as the authorized repre-

sentative of the telegraph employees on the Pennsylvania. This recognition was refused by the Pennsylvania since it is not in accordance with the employee representation plan in force on that road. The Labor Board intervened in the dispute when it became apparent that a strike vote was imminent and that serious consequences might result if the disagreement was allowed to take its course.

R. H. Aishton Addresses Car Inspectors and Foremen

The twenty-third annual convention of the Chief Interchange Car Inspectors' and Car Foremen's Association was held at Chicago, September 23 to 25, inclusive, a feature of the opening session being a short address by R. H. Aishton, president of the American Railway Association. Among other things, Mr. Aishton said: "The public is chiefly concerned with service, the economy and efficiency with which this service is manufactured being secondary. One of the things that produced success last year, and is bringing it now, is the movement per car per day. One mile more per car per day means automatically adding 100,000 cars to the equipment of the country. As car inspectors and foremen, you gentlemen have a large and important part in bringing about that result. Cars in bad order, in moving trains, cost money in switching out, and entail delay to equipment and freight being carried, on top of the cost of making repairs. This can be reduced to a minimum only by complete knowledge and an intelligent inspection by the inspectors and car foremen." Other papers on the convention program include "Freight Claim Prevention," by Joseph Marshall, special representative, American Railway Association; "Efficiency and Heavy Car Repair Shop Operation," by H. W. Williams, special representative to the superintendent of motive power, Chicago, Milwaukee & St. Paul; "Automobile Loading in Closed and Open Cars," by P. Alquist, master car builder, Delaware, Lackawanna & Western; "Steel Car Repairs," by J. A. Roberts, chief A. R. A. clerk, Chesapeake & Ohio; "A. R. A. Billing," by B. F. Jamison, special traveling auditor, Southern Railway.

Northern Pacific Signal Celebration

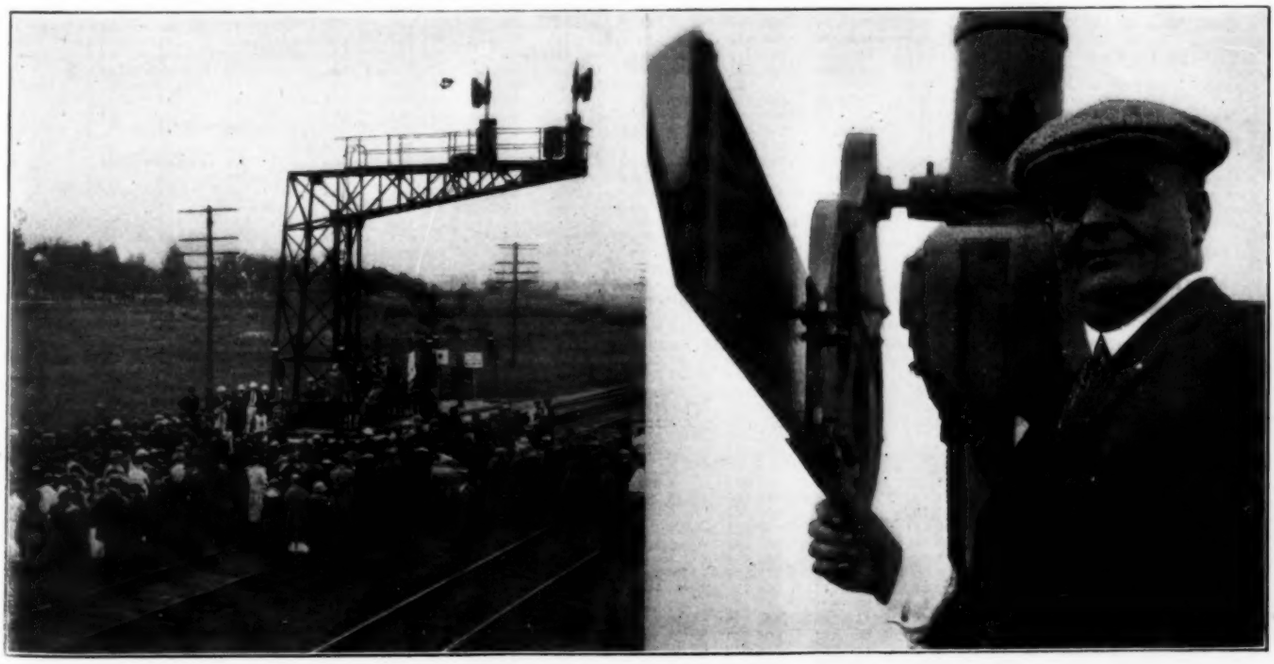
The completion of the construction of automatic block signals throughout the length of the Northern Pacific Railway from Lake Superior to the Pacific Coast, was noticed in the *Railway Age* of September 20, page 516.

D. F. Lyons, general solicitor of the railway company, who was one of the speakers at the celebration, characterized the event as being second only in importance to the driving of the last spike, on the Northern Pacific, which took place at Gold Creek, Mont., on September 8, 1883. The total first cost of the automatic signals on the main line and the Northern Pacific was $4,525,000.

The illustrations show the celebration at Little Falls, Minn., on September 15 and C. A. Christofferson, signal engineer of the road, fastening on the last signal blade. Mr. Christofferson, is well known to readers of the *Railway Age*, having been president of the Signal Section of the American Railway Association last year. He was born in Denmark, in 1865, and began his work in this field as a foreman for the Union Switch & Signal Company in 1887. For nine years he was signal engineer of the Cleveland, Cincinnati, Chicago & St. Louis, and then for ten years of the Chicago Great Western. He has been signal engineer of the Northern Pacific since February, 1909.

Stockholders Organize

The Railroad Owners' Association, 801 Hibbs building, Washington, D. C., has been organized by stockholders of railroads of the United States to protect their interests. The association will at once proceed to bring railroad matters to the attention of Congress and members of the Interstate Commerce Commission. It will confer with and assist the managers of railroads, as well as confer with and take part in matters before the Interstate Commerce Commission and Congress affecting their properties. The association, which has been taking shape during the past five months, assumed definite form at a meeting of a group of stockholders in June. Among the objects of the organization will be the appointment of a representative to treat with the Interstate Commerce Commission on all matters affecting interests of railroad owners, to remove misunderstandings now existing in the minds of many legislators on the railroad situation and to create a feeling of friendliness, assistance and co-operation on the part of these public officers. The organization also will endeavor to place in the hands of the farmers in the United States a plain, simple and concise statement of the facts concerning the railroads and their relation to the farmer and the prices of his products, in order to show that a prosperous railroad is absolutely necessary for a prosperous farmer and a prosperous country. It will also confer with and assist the managers of railroads in their efforts in the public interest in all directions, seek legislation looking to the reduction of the interest rates charged railroads by the government to a rate covering cost only to the government, and to the refunding of amounts charged in excess of cost. The Organization Committee consists of Floyd W. Mundy, chairman, New York; J. D. Shatford, Washington, D. C.; J. V. Ryan, New York; Arthur S. Pierce, New Jersey; Frederic M. Halsey, New York, and R. J. Marony, New York.



Celebration at Little Falls, Mont.—C. A. Christofferson Affixing Last Signal Blade

Freight Operating Statistics of Large Steam Roads—Selected Items for the Month of July, 1924,

Region, road and year	Average miles of road operated	Train-miles	Locomotive-miles: Principal and helper	Locomotive-miles: Light	Car-miles: Loaded (thousands)	Car-miles: Per cent loaded	Ton-miles (thousands): Gross, Excluding locomotive and tender	Ton-miles (thousands): Net, Revenue and non-revenue	Average number of locomotives on line daily: Serviceable	Unserviceable	Per cent unserviceable	Stored
New England Region:												
Boston & Albany	1924 394	248,601	264,313	25,783	4,695	65.0	251,107	97,077	128	19	12.9	...
	1923 394	294,513	311,668	29,010	5,520	65.5	300,709	122,378	114	28	19.6	...
Boston & Maine	1924 2,455	499,952	569,164	54,919	11,633	69.1	588,845	239,160	320	144	31.0	37
	1923 2,455	612,800	679,505	64,305	12,730	68.0	677,589	281,397	333	140	29.6	...
N. Y., New H. & Hartf.	1924 1,966	489,663	515,198	31,543	12,622	67.2	653,418	266,408	309	65	17.3	36
	1923 1,974	550,194	588,920	39,112	12,821	67.3	685,542	292,239	303	81	21.0	2
Great Lakes Region:												
Delaware & Hudson	1924 888	355,657	477,621	40,273	9,289	63.5	593,536	291,264	254	32	11.2	80
	1923 886	420,456	589,819	53,291	11,315	63.9	756,448	390,184	238	61	20.2	15
Del., Lack. & Western	1924 993	503,396	583,892	79,588	15,341	67.9	867,368	383,525	300	63	17.3	44
	1923 993	545,999	659,899	102,682	16,736	67.6	939,622	432,839	280	73	20.7	6
Erie (inc. Chic. & Erie)	1924 2,325	886,003	989,387	106,747	32,108	64.9	1,932,814	843,748	662	102	13.4	187
	1923 2,309	1,012,373	1,152,774	70,568	36,323	68.9	2,136,286	996,448	676	136	16.8	127
Lehigh Valley	1924 1,357	566,051	619,455	60,999	16,598	67.2	986,627	465,216	468	81	14.7	135
	1923 1,317	603,169	666,365	75,910	17,459	70.2	1,033,695	520,076	378	170	31.0	33
Michigan Central	1924 1,827	526,037	541,438	22,460	16,750	60.7	926,486	329,358	295	60	16.9	93
	1923 1,827	531,816	541,696	21,585	17,563	65.4	954,629	386,920	319	79	19.8	43
New York Central	1924 6,447	1,765,976	1,997,646	134,552	63,280	61.7	3,785,492	1,607,690	1,220	435	26.3	446
	1923 6,469	2,241,708	2,553,695	197,813	80,248	62.2	4,923,167	2,220,611	1,321	417	24.0	308
New York, Chic. & St. L.	1924 1,669	589,029	600,593	6,875	17,113	62.3	956,632	358,055	260	55	17.4	74
	1923 1,669	683,799	689,720	5,522	19,195	67.0	1,035,835	423,393	205	78	27.5	7
Pere Marquette	1924 2,227	357,769	369,919	9,822	8,680	64.4	490,964	221,280	190	22	10.3	36
	1923 2,197	390,759	404,021	8,846	9,233	67.3	547,261	250,580	175	40	18.6	10
Pitts. & Lake Erie	1924 231	105,204	108,827	1,036	3,434	64.3	269,751	162,992	65	25	27.4	18
	1923 231	170,225	173,600	1,909	6,122	65.2	459,414	276,181	74	20	21.1	10
Wabash	1924 2,459	582,235	607,332	9,530	17,787	67.0	985,122	405,067	309	52	14.4	68
	1923 2,418	625,354	655,518	12,628	18,239	70.1	977,066	406,846	245	89	26.6	...
Central Eastern Region:												
Baltimore & Ohio	1924 5,207	1,697,280	1,925,379	152,838	46,675	63.2	2,896,484	1,376,357	1,002	309	23.6	222
	1923 5,212	2,244,648	2,584,351	167,548	59,362	63.5	3,858,407	1,946,283	1,098	180	14.1	79
Central of New Jersey	1924 692	286,836	306,858	34,776	6,730	59.5	441,076	209,339	237	41	14.9	38
	1923 695	285,233	310,716	37,546	7,001	62.2	448,688	220,871	203	66	24.5	...
Chicago & Eastern Ill.	1924 945	208,737	209,844	2,791	5,556	66.8	313,481	146,699	128	35	21.2	54
	1923 945	230,705	232,270	4,342	5,807	64.4	336,419	160,332	130	58	30.8	33
Clev., Cin., Chic. & St. L.	1924 2,380	632,299	667,002	12,210	19,082	60.1	1,210,367	554,461	327	106	24.4	66
	1923 2,377	703,636	741,267	6,733	21,485	61.5	1,368,091	656,658	341	110	24.4	45
Elgin, Joliet & Eastern[1]	1924 460	85,247	88,991	2,327	2,530	65.9	173,884	97,642	88	11	11.1	21
	1923 460	144,390	155,654	6,218	4,104	64.1	326,095	178,292	83	17	17.2	2
Long Island	1924 393	45,517	49,525	8,220	545	56.6	33,735	12,679	41	15	26.9	2
	1923 393	46,084	56,868	9,761	579	58.1	35,326	13,757	37	17	31.2	...
Pennsylvania System	1924 10,942	4,341,447	4,652,126	320,214	120,437	63.8	7,788,371	3,642,517	2,653	892	25.2	426
	1923 10,907	5,373,165	5,896,177	453,118	143,006	63.3	9,826,808	4,937,720	2,671	663	19.9	31
Reading	1924 1,141	586,806	640,340	58,265	14,003	61.1	967,726	475,265	426	78	15.4	153
	1923 1,142	680,718	754,673	78,938	17,283	64.5	1,171,489	629,033	364	104	22.3	63
Pocahontas Region:												
Chesapeake & Ohio	1924 2,555	1,000,115	1,063,788	32,814	29,940	57.4	2,366,392	1,282,122	439	94	17.6	19
	1923 2,553	926,165	1,014,570	27,188	28,352	57.9	2,204,844	1,202,860	464	85	15.5	30
Norfolk & Western	1924 2,231	808,767	982,485	24,973	23,218	58.0	1,902,837	997,916	581	100	14.6	165
	1923 2,228	885,533	1,096,271	36,161	25,839	60.5	2,073,821	1,130,519	546	158	22.4	57
Southern Region:												
Atlantic Coast Line	1924 4,865	747,831	756,329	12,887	17,061	61.2	921,243	354,419	391	60	13.2	72
	1923 4,861	657,883	661,303	10,107	15,507	65.6	823,077	342,701	317	82	20.5	37
Central of Georgia	1924 1,907	373,152	377,903	7,970	7,406	68.6	389,216	154,063	145	16	10.0	2
	1923 1,907	341,483	346,047	7,729	6,566	68.9	353,615	151,178	125	13	9.1	...
I. C. (inc. Y. & M. V.)	1924 6,197	1,600,121	1,615,608	35,073	43,844	60.5	2,771,007	1,131,300	752	125	14.2	88
	1923 6,190	1,872,836	1,886,516	40,387	50,879	63.1	3,192,644	1,438,408	732	107	12.7	1
Louisville & Nashville	1924 5,026	1,603,037	1,700,082	62,119	30,643	62.9	1,930,235	909,601	592	109	15.5	61
	1923 5,032	1,698,996	1,808,779	67,916	30,946	61.2	2,029,627	980,590	584	119	16.9	...
Seaboard Air Line	1924 3,547	524,592	545,226	6,354	11,768	64.5	636,948	236,083	245	29	10.5	16
	1923 3,553	439,229	449,436	13,388	9,841	70.3	514,110	218,159	200	49	19.6	12
Southern Ry.	1924 6,840	1,444,958	1,472,273	29,365	31,950	64.3	1,762,644	627,994	869	111	11.3	27
	1923 6,942	1,523,700	1,564,371	34,575	33,987	69.1	1,797,764	782,579	771	146	16.0	...
Northwestern Region:												
Chic. & North Western	1924 8,463	1,427,660	1,475,597	20,120	32,909	60.8	1,906,264	740,710	821	233	22.1	126
	1923 8,463	1,628,357	1,698,045	21,204	36,742	61.0	2,182,693	945,631	910	190	17.3	44
Chic., Milw. & St. P.	1924 10,983	1,392,838	1,435,581	65,791	38,683	63.7	2,174,638	926,421	949	162	14.6	147
	1923 11,007	1,748,706	1,796,647	70,538	44,616	63.0	2,551,312	1,113,301	868	181	17.2	35
Chic., St. P., Minn. & Om.	1924 1,726	295,308	326,219	12,877	5,797	68.1	310,289	136,748	168	35	17.3	1
	1923 1,726	308,099	338,941	14,777	6,017	64.9	326,315	150,063	160	44	21.5	12
Great Northern	1924 8,251	714,666	733,192	31,672	24,468	64.7	1,495,533	746,932	585	160	21.4	142
	1923 8,256	880,032	910,478	44,533	26,731	61.0	1,688,758	829,407	566	175	23.6	92
M., St. P. & S. Ste. M.	1924 4,374	486,461	495,981	6,851	11,590	66.8	624,772	280,463	291	52	15.2	12
	1923 4,374	539,637	546,087	8,130	12,607	69.5	663,573	312,193	287	56	16.2	2
Northern Pacific	1924 6,415	717,314	749,403	41,260	20,769	68.5	1,146,898	496,266	586	139	19.2	156
	1923 6,415	838,681	881,594	58,105	22,377	63.8	1,325,623	569,366	549	140	20.3	36
Oreg.-Wash. R. R. & Nav.	1924 2,168	185,817	195,572	17,269	4,884	72.5	269,034	123,776	138	22	13.5	20
	1923 2,143	200,237	211,301	21,555	4,700	63.3	273,748	118,498	143	28	16.4	11
Central Western Region:												
Atch., Top. & S. Fe	1924 9,979	1,572,022	1,676,138	82,544	46,455	65.4	2,716,196	1,021,753	822	143	14.8	203
	1923 9,869	1,665,936	1,772,647	93,987	47,602	66.9	2,683,035	1,021,246	730	185	20.2	64
Chicago & Alton	1924 1,017	293,849	298,687	3,284	6,944	62.3	420,931	179,040	134	22	13.8	42
	1923 1,010	321,508	327,039	4,762	7,753	64.1	458,427	196,171	119	35	22.9	11
Chic., Burl. & Quincy	1924 9,332	1,376,846	1,420,493	53,938	37,473	61.5	2,226,860	974,147	797	211	21.0	94
	1923 9,338	1,545,380	1,603,054	80,153	41,186	62.8	2,456,004	1,120,988	762	205	21.2	36
Chic., Rock I. & Pacific	1924 7,595	1,536,569	1,562,917	13,262	35,351	63.1	2,041,104	828,525	614	177	22.4	29
	1923 7,635	1,490,060	1,523,916	16,372	32,486	62.8	1,852,209	781,313	524	262	33.3	8
Denver & R. G. Wn.	1924 2,610	200,996	246,164	49,140	5,062	68.2	296,773	145,080	261	69	20.9	69
	1923 2,593	245,848	307,743	62,830	5,051	67.6	303,653	148,787	232	118	34.6	1
Oregon Short Line	1924 2,374	298,216	311,644	19,709	7,619	65.0	457,902	197,655	195	27	12.2	68
	1923 2,367	340,384	355,903	23,839	7,586	60.4	465,744	199,100	159	54	25.3	15
Southern Pac. (Pac. Sys.)	1924 7,009	1,259,468	1,390,961	229,254	37,371	62.4	2,275,896	868,524	657	181	21.6	70
	1923 6,938	1,495,628	1,679,728	293,163	41,798	62.4	2,547,135	963,919	630	141	18.2	4
Union Pacific	1924 3,717	915,423	925,426	35,814	30,226	58.5	1,862,508	633,532	453	67	12.8	186
	1923 3,709	1,137,120	1,172,233	74,693	34,394	59.9	2,046,339	689,112	427	90	17.3	108
Southwestern Region:												
Gulf, Colo. & S. Fe	1924 1,897	282,239	295,636	4,944	7,849	64.4	477,268	215,511	124	18	12.4	16
	1923 1,897	282,498	290,501	5,217	7,278	63.8	437,816	197,120	119	20	14.4	12
Mo.-Kans.-Tex.	1924 1,787	236,424	236,704	9,322	8,171	62.7	457,971	182,258	141	43	23.3	64
	1923 1,871	287,593	288,061	9,398	8,811	66.0	498,595	189,624	144	87	37.8	57
Mo.-Kans.-Tex. of Tex.	1924 1,389	182,450	190,664	2,262	4,640	62.9	268,675	110,072	100	23	18.8	30
	1923 1,389	180,093	184,856	4,037	3,959	63.2	231,045	96,489	71	54	43.3	7
Missouri Pacific	1924 7,302	1,248,891	1,273,277	40,634	31,191	64.0	1,857,290	820,414	460	161	26.0	23
	1923 7,112	1,162,955	1,174,170	39,789	27,742	66.4	1,597,004	719,532	418	208	33.2	...
St. Louis-San Francisco	1924 4,683	834,826	862,477	16,667	17,302	63.5	1,015,625	433,526	414	77	15.7	53
	1923 4,683	876,204	890,198	16,479	16,872	65.7	966,298	421,656	365	135	27.0	28
Southern Pacific Lines (in Tex. and La.)[2]	1924 3,710	606,314	607,871	4,389	13,648	66.6	901,971	353,795	230	58	20.0	31
	1923 3,710	606,289	608,012	4,565	12,871	64.4	778,416	335,897	209	79	27.4	17
Texas & Pacific	1924 1,953	292,043	292,043	4,324	7,005	62.7	417,714	166,115	159	38	19.5	30
	1923 1,953	244,756	244,872	1,844	5,932	69.2	319,726	135,700	160	47	22.6	48

[1]No passenger-train service. [2]Includes Galveston, Harrisburg & San Antonio, Houston & Shreveport, Houston & Texas Central, Houston East & West Texas, Iberia & Vermilion, Lake Charles & Northern, Louisiana Western, Morgan's La. & Tex. R. R. & S. S. Co., and Texas & New Orleans.

Compared with July, 1923, for Roads with Annual Operating Revenues above $25,000,000.

Region, road and year	Average number of freight cars on line daily: Home	Foreign	Total	Per cent unserviceable	Stored	Gross tons per train, excluding locomotive and tender	Net tons per train	Net tons per loaded car	Net ton-miles per car-day	Car miles per car-day	Net ton-miles per mile of road per day	Pounds of coal per 1,000 gross ton-miles including locomotive and tender	Locomotive miles per locomotive day
New England Region:													
Boston & Albany....1924	2,711	4,859	7,570	5.2	....	1,010	390	20.7	414	30.8	7,949	189	63.4
1923	2,042	6,514	8,556	3.6	....	1,021	416	22.2	461	31.8	10,021	174	77.4
Boston & Maine....1924	15,228	14,039	29,267	12.3	....	1,178	478	20.6	264	18.5	3,143	140	43.4
1923	13,518	18,823	32,341	10.9	....	1,106	459	22.1	281	18.7	3,698	168	50.8
N. Y., New H. & Hartf...1924	22,900	17,400	40,300	19.6	977	1,334	544	21.1	213	15.0	4,385	135	47.2
1923	20,154	20,490	40,644	18.3	....	1,246	531	22.8	232	15.1	4,775	157	52.8
Great Lakes Region:													
Delaware & Hudson....1924	9,625	5,727	15,352	6.3	....	1,669	819	31.4	612	30.7	10,581	174	58.5
1923	8,844	9,404	18,248	7.5	....	1,799	928	34.5	690	31.3	14,201	183	69.4
Del., Lack. & Western....1924	19,706	6,574	26,274	3.8	1,650	1,723	762	25.0	471	27.8	12,465	149	59.0
1923	14,325	10,586	24,911	4.2	....	1,721	793	25.9	560	32.0	14,060	177	69.5
Erie (inc. Chic. & Erie)..1924	40,287	16,962	57,249	7.4	....	2,181	952	26.3	475	27.9	11,708	120	46.3
1923	25,389	26,922	52,311	10.7	....	2,110	984	27.4	614	32.5	13,918	124	48.6
Lehigh Valley 1924	24,596	8,021	32,617	6.5	1,096	1,743	822	28.0	460	24.4	11,063	157	40.0
1923	19,482	13,619	33,101	5.5	106	1,714	862	29.8	507	24.3	12,740	164	43.7
Michigan Central 1924	18,489	13,830	32,319	4.7	5,118	1,761	626	19.7	329	27.6	5,816	115	51.3
1923	10,847	17,816	28,663	8.6	....	1,795	728	22.0	435	30.2	6,833	113	45.7
New York Central.....1924	76,260	61,584	137,844	5.5	27,331	2,144	910	25.4	376	24.0	8,044	114	41.6
1923	58,390	92,713	151,103	8.1	5,009	2,196	991	27.7	474	27.6	11,074	114	51.0
New York, Chic. & St. L..1924	13,346	9,446	22,792	5.0	4,122	1,624	608	20.9	507	38.8	6,922	107	62.3
1923	4,834	14,502	19,336	10.8	....	1,515	619	22.1	706	47.8	8,185	123	79.2
Pere Marquette 1924	11,133	8,674	19,807	6.0	1,861	1,372	619	25.5	360	22.0	3,205	113	58.0
1923	8,536	15,746	24,282	4.6	....	1,401	641	27.1	333	18.2	3,679	123	62.1
Pitts. & Lake Erie.....1924	17,084	6,268	23,352	3.2	3,473	2,564	1,549	47.5	225	7.4	22,716	67	39.6
1923	8,897	12,970	21,867	14.9	....	2,699	1,622	45.1	407	13.8	38,532	71	60.6
Wabash 1924	14,318	8,524	22,842	3.4	1,305	1,692	696	22.8	572	37.5	5,313	129	55.1
1923	10,417	12,368	22,785	3.3	413	1,562	651	22.3	576	36.9	5,428	132	64.6
Central Eastern Region:													
Baltimore & Ohio.....1924	75,768	28,364	104,132	10.8	11,405	1,707	811	29.5	426	22.9	8,527	158	51.1
1923	56,660	45,583	102,243	3.6	....	1,719	867	32.8	614	29.5	12,046	168	69.5
Central of New Jersey....1924	19,542	9,613	29,155	4.8	3,153	1,571	745	31.1	232	12.5	9,759	167	39.6
1923	12,822	14,037	26,859	11.5	....	1,573	774	31.5	265	13.5	10,258	172	41.8
Chicago & Eastern Ill.....1924	16,625	4,072	20,697	16.7	5,437	1,502	703	26.4	229	13.0	5,007	143	42.3
1923	12,947	5,199	18,146	18.4	....	1,458	696	27.6	285	16.0	5,472	172	40.8
Clev., Cin., Chic. & St. L..1924	18,664	16,466	35,130	6.3	4,646	1,914	877	29.1	509	29.1	7,515	114	50.7
1923	12,315	23,721	36,036	6.1	....	1,944	933	30.6	588	31.3	8,913	120	53.6
Elgin, Joliet & Eastern[1]...1924	9,908	5,142	15,050	6.6	2,063	2,040	1,145	38.6	209	8.2	6,850	131	29.7
1923	8,529	7,817	16,346	9.9	....	2,258	1,235	43.4	352	12.6	12,510	108	52.0
Long Island 1924	1,825	4,452	6,277	0.9	159	741	279	23.3	65	4.9	1,040	272	33.0
1923	1,556	5,435	6,991	1.9	....	767	299	23.8	63	4.6	1,128	339	40.4
Pennsylvania System 1924	210,071	84,127	294,198	9.9	44,865	1,794	839	30.2	399	20.7	10,739	126	45.3
1923	166,954	113,427	280,381	3.9	1,853	1,829	919	34.5	568	26.0	14,604	136	61.5
Reading 1924	25,381	11,530	36,911	2.5	4,876	1,649	810	33.9	415	20.0	13,444	163	44.7
1923	15,999	21,833	37,832	4.9	....	1,721	924	36.4	536	22.8	17,766	164	57.4
Pocahontas Region:													
Chesapeake & Ohio.....1924	28,830	10,864	39,694	6.0	1,827	2,366	1,280	42.8	1,042	42.4	16,187	112	66.5
1923	27,644	16,036	43,680	6.9	....	2,381	1,299	42.4	888	36.2	15,199	114	61.2
Norfolk & Western.....1924	29,976	7,931	37,907	3.7	1,914	2,353	1,234	43.0	849	34.0	14,430	151	47.7
1923	27,311	13,167	40,478	5.4	....	2,342	1,277	43.8	901	34.0	16,366	170	51.9
Southern Region:													
Atlantic Coast Line.....1924	20,330	10,349	30,679	5.3	....	1,232	474	20.8	367	29.0	2,350	122	55.1
1923	16,387	11,571	27,958	7.9	....	1,251	521	22.1	395	27.3	2,274	129	54.4
Central of Georgia.....1924	4,936	6,595	11,531	5.3	....	1,043	413	20.8	431	30.5	2,606	149	77.3
1923	2,933	7,221	10,154	4.6	....	1,036	443	23.0	480	30.3	2,558	171	83.3
I. C. (inc. Y. & M. V.)...1924	48,338	17,968	66,306	7.1	2,574	1,732	707	25.8	550	35.2	5,888	121	60.8
1923	35,540	30,624	66,164	7.0	1,802	1,705	763	28.1	696	39.3	7,444	131	74.1
Louisville & Nashville.....1924	43,879	16,194	60,073	12.4	105	1,204	567	29.7	487	26.1	5,838	156	81.2
1923	33,385	21,905	55,290	16.0	64	1,195	577	31.7	572	29.4	6,286	164	86.2
Seaboard Air Line.....1924	10,245	7,493	17,738	7.0	....	1,214	450	20.1	429	33.2	2,147	140	65.1
1923	9,146	8,652	17,798	21.6	....	1,171	497	22.2	395	25.4	1,981	156	60.1
Southern Ry. 1924	41,031	17,495	58,526	6.2	....	1,220	476	21.5	379	27.4	3,245	166	49.4
1923	29,752	29,607	59,359	4.8	....	1,180	514	23.0	425	26.7	3,636	185	56.2
Northwestern Region:													
Chic. & North Western...1924	50,839	24,028	74,867	10.0	....	1,335	519	22.5	319	23.3	2,823	136	45.8
1923	43,755	32,117	75,872	7.3	....	1,340	581	25.7	402	25.6	3,605	144	50.4
Chic., Milw. & St. P.....1924	56,948	20,764	77,712	7.1	....	1,561	665	23.9	385	25.2	2,721	138	43.6
1923	50,044	33,079	83,123	8.5	....	1,459	637	25.0	432	27.5	3,263	140	57.5
Chic., St. P., Minn. & Om..1924	3,759	8,878	12,637	8.1	731	1,051	429	21.9	323	21.7	2,369	126	54.0
1923	3,222	8,916	12,138	12.3	576	1,059	422	21.6	346	24.7	2,430	149	56.0
Great Northern 1924	48,830	7,484	56,314	10.4	....	2,093	1,045	30.5	428	21.7	2,920	112	33.1
1923	48,672	9,831	58,503	7.7	....	1,919	942	31.0	457	24.2	3,241	122	41.6
M., St. P. & S. Ste. M..1924	21,097	6,554	27,651	6.7	3,164	1,284	577	24.2	327	20.2	2,068	108	47.3
1923	18,672	8,334	27,006	8.9	2,317	1,230	579	24.8	373	21.7	2,302	109	52.1
Northern Pacific 1924	35,915	7,768	43,683	7.5	3,160	1,599	692	23.9	366	22.4	2,495	117	35.2
1923	31,727	11,851	43,578	8.8	3,442	1,581	679	25.4	421	26.0	2,863	122	44.0
Oreg.-Wash. R. R. & Nav..1924	5,481	4,319	9,800	4.7	....	1,448	666	25.3	407	22.2	1,841	186	43.1
1923	6,117	6,316	12,433	4.0	....	1,367	592	25.2	307	19.2	1,783	199	44.0
Central Western Region:													
Atch., Top. & S. Fe.....1924	56,977	13,878	70,855	6.8	11,585	1,728	650	22.0	465	32.4	3,303	120	58.8
1923	49,970	20,868	70,838	7.5	11,886	1,611	613	21.5	465	32.4	3,338	135	65.8
Chicago & Alton.....1924	10,307	4,426	14,733	3.7	4,300	1,432	609	25.8	392	24.4	5,679	132	62.6
1923	7,857	6,946	14,803	8.6	....	1,426	610	25.3	427	26.4	6,264	131	69.4
Chic., Burl. & Quincy.....1924	54,786	18,159	72,945	8.1	3,873	1,617	708	26.0	430	26.9	3,367	146	47.2
1923	47,889	23,725	71,614	6.3	4,133	1,589	725	27.2	504	29.4	3,873	155	56.2
Chic., Rock I. & Pacific...1924	36,359	20,146	56,505	11.3	8,349	1,328	539	23.4	465	31.6	3,519	146	64.3
1923	30,604	26,627	57,231	10.2	7,602	1,243	504	23.1	423	29.2	3,174	157	63.2
Denver & R. G. Wn.....1924	13,572	3,220	16,792	6.9	5,328	1,474	722	28.7	278	14.1	1,793	190	28.9
1923	11,782	3,777	15,559	7.9	1,779	1,235	605	29.5	308	15.5	1,851	228	35.2
Oregon Short Line.....1924	7,245	4,029	11,274	6.9	....	1,519	663	25.9	566	33.5	2,685	135	48.2
1923	7,518	3,859	11,377	7.7	....	1,368	585	26.2	565	35.6	2,714	136	57.7
Southern Pac. (Pac. Sys.).1924	24,560	28,246	52,806	6.4	4,992	1,807	690	23.2	531	36.4	3,997	126	62.4
1923	19,967	30,435	50,402	3.4	....	1,703	644	23.1	617	42.8	4,483	138	82.6
Union Pacific 1924	22,354	10,116	32,470	9.9	....	2,035	692	21.0	629	51.3	5,499	122	59.7
1923	18,710	15,149	33,859	8.2	....	1,800	606	20.0	657	54.7	5,994	135	77.8
Southwestern Region:													
Gulf, Colo. & S. Fe.....1924	7,952	4,625	12,577	4.6	237	1,691	764	27.5	553	31.3	3,665	105	68.5
1923	5,594	4,905	10,499	5.5	800	1,550	698	27.1	606	35.1	3,352	120	68.5
Mo.-Kans.-Tex. 1924	10,883	5,546	16,429	3.6	3,850	1,937	771	22.3	353	25.3	3,290	97	43.2
1923	8,403	7,504	15,907	7.4	2,786	1,734	659	21.5	385	29.8	3,270	114	41.6
Mo.-Kans.-Tex. of Tex.....1924	329	11,072	11,401	11.8	3,376	1,473	603	23.7	297	20.1	2,556	109	50.8
1923	326	8,736	9,062	14.4	967	1,283	536	24.4	343	22.3	2,240	128	48.9
Missouri Pacific 1924	29,954	18,274	48,228	8.3	....	1,487	657	26.3	549	32.6	3,624	132	68.3
1923	23,855	25,758	49,613	9.2	....	1,373	619	25.9	468	27.2	3,264	147	62.6
St. Louis-San Francisco...1924	22,269	10,586	32,855	5.0	1,970	1,217	519	25.1	426	26.8	2,986	154	57.7
1923	19,903	14,788	34,691	7.2	1,610	1,103	481	25.0	392	23.9	2,904	169	58.6
Southern Pacific Lines (in Tex. and La.)[2].....1924	9,246	14,311	23,557	6.0	3,029	1,323	584	25.9	484	27.9	3,076	114	68.6
1923	6,265	13,720	19,985	6.0	400	1,284	554	26.1	542	32.3	2,920	120	68.6
Texas & Pacific.....1924	6,394	5,094	11,488	11.4	....	1,430	569	23.7	466	31.4	2,744	120	48.4
1923	3,849	6,068	9,917	10.5	....	1,306	554	22.9	441	27.9	2,242	133	38.5

Compiled by the Bureau of Statistics, Interstate Commerce Commission. Subject to revision.

Progressive Campaign Text-Book on Railroads

The La Follette-Wheeler Progressive campaign headquarters in Washington has released to the press some extracts from that part of its campaign handbook dealing with railroad subjects, in which the Esch-Cummins law is denounced as a "legislative crime" and "the railroads' post-war charter of privilege," which it is claimed has increased the cost of living by $4,500,000,000 a year. This is calculated on the basis of a $1,500,000,000 a year increase in rates made by the commission in 1920, which is called a "burden of $75 a year to each American family, and because of a statement once made by former Director General Hines that an increase in freight rates is likely to be multiplied by middlemen before it reaches the consumer, it is declared that the direct increase in the cost of living "attributable to the Esch-Cummins law" is $225 per family. No reference is made to the subsequent reductions in rates.

Reference is made to the guaranty for the six months of 1920, following federal control, under cover of which it is stated the railroads "entered upon an orgy of waste, corruption and graft." Another statement is that every important provision of the law was drafted "either by the railroads or by the U. S. Chamber of Commerce." Because federal taxes are deducted before the "net railway operating income" is reached, the statement says that the 5¾ per cent, which the commission had held to be a fair return, amounts to an actual rate of 6.57 per cent, and because the capitalization represented by bonds pays a lower rate, it is calculated that the rate on the stock is 8.76 per cent. It is not stated that the stock is actually earning at such a rate, but the statement is made that "as a matter of fact many railroads are earning far more than this."

The recapture clause of the law is characterized as "absolutely valueless as far as the public is concerned," and the statement is made that no "Class A" railroad has paid a penny into the federal treasury and that the few small railroads which have pretended to obey the law have paid in "only the ridiculous amount of $223,789." In a statement to the House and Senate committees, the Interstate Commerce Commission reported the amount of its collections on this account as $3,655,559 as of May 9, including three Class I railroads.

The statement which has recently been made by some of the more prominent of the "progressives" that the Canadian National Railways had a surplus last year of $20,236,563, is corrected in this statement by referring to the amount as an "operating surplus." In conclusion the statement says:

"The Progressives are not committed to any particular plan of public ownership," the handbook states. "They will, however, demand that any plan that may be submitted for approval shall embody the following fundamental principles:

"Adequate compensation for every dollar honestly invested;

"Freedom from bureaucratic control;

"Complete protection for the rights of all employees;

"Elimination of politics and patronage;

"Operation for service, not profit, upon the basis of actual cost."

Hearings on Crow's Nest Pass Rates

A hearing of vital interest to most of the Dominion of Canada was opened in Ottawa last week by the Dominion Board of Railway Commissioners, who are listening to arguments for and against the freight rates restored to effect on July 7 last when the Crow's Nest Pass Agreement was again brought into full effect. Some of the Dominion's most eminent counsel are present at the hearing representing the railways, various trade organizations and provincial governments. Included in these are: Eugene Lafleur of Montreal, for the Railway Association of Canada; W. N. Tilley, a director of the company, and E. P. Flintoft, for the Canadian Pacific; Alistair Fraser for the Canadian National; H. J. Symington of Winnipeg, for the three Prairie Provinces; G. G. McGeer and Premier John Oliver for the government of British Columbia; and Isaac Pitblado of Winnipeg, for the Canadian Manufacturers' Association. The hearing opened on Wednesday of last week and adjourned on Thursday evening to Monday of this week. Those first two days were occupied with the filing of documents and affidavits from various organizations protesting against the discrimination in rates under the Crow's Nest pact, and next week will be occupied with argument by the various counsel.

Near the close of last Thursday's sitting Mr. Lafleur, for all the railways, briefly outlined the argument which they would advance in defense of the Crow's Nest rates. The railways would contend in the first instance, said Mr. Lafleur, that the Dominion Railway Board had power to vary rates set under the Crow's Nest Agreement. In the second instance, the railways would contend, if it was argued that the Board had not that power, that they were protected in the rates they had filed under the Crow's Nest Agreement by statute of Parliament.

"Double discrimination" was charged in his preliminary argument by Mr. Pitblado, representing the Canadian Manufacturers' Association. He described the situation arising out of the restoration of the agreement as intolerable. A shipper sending agricultural implements from Brantford, Ont., to Regina, Sask., paid $1.28 per 100 pounds, while another shipper at Hamilton, Ont. (a few miles east of Brantford), also shipping to Regina, paid 96 cents per 100 pounds. There was, he contended, not only discrimination at the point of destination, but it was impossible to go on doing business under the rate structure that had been created by the railways. There was double discrimination for, if a shipment was made at a point which was not on the Canadian Pacific in 1897, the shipper did not get the Crow's Nest rate. Further, if the shipment was made from a point enjoying the Crow's Nest rate to a point which did not, again the shipper did not get the lower rate. He referred to "the irritating and disturbing manner" in which the railways interpreted the Crow's Nest Pass Agreement in filing tariffs before the Dominion Railway Board. For example, the railways refused to grant the Crow's Nest rate on shipments of farm wagons, although agricultural implements got the reduced rate. The railways, he said, were not living up to the letter of the agreement, for they were granting the reduced rate on grain shipments all over the West, but were refusing those rates on agricultural implements and other manufactured commodities at many Eastern points.

G. G. McGeer, for British Columbia, read an affidavit from Thomas Bulman, a prominent fruit grower and shipper in the Okanagan valley of the province, in which the latter stated that the discrimination under the agreement would prove ruinous to the great fruit industry of the coast province, and Mr. McGeer argued that the onus lay upon the railways to justify the discrimination.

In connection with this freight rates fight an interesting statement, revealing the attitude of the dominion government, was made last week in Vancouver by J. H. King, Minister of Public Works in the federal government. "The present freight rate structure in Canada is obsolete," said Dr. King, "it must be thrown into the melting pot and completely recast, for Canada must be divided into two transportation slopes, the east and the west, and the railways must work together for the people." For many years past, he continued, the railways had been working on a policy of expendiency. Instead of works being worked out on an economic and scientific basis, they have simply been altered from time to time, by adding or subtracting to or from the original tariff, as recurrent circumstances dictated. Today no one knew where he was at.

List of Exhibitors at Traveling Engineers' Meeting

The following is a list of the exhibitors at the 1924 convention of the Traveling Engineers' Association which exceeded in size and diversity of products any exhibition previously held in conjunction with this convention:

American Arch Company, New York.—Literature on locomotive and power plant arches. Represented by L. G. Parish, Major W. L. Allison, R. J. Himmelright, J. T. Anthony, A. W. Clckey, W. E. Salisbury, E. C. Cook, W. W. Neale, A. L. Sucese, G. Wagstaff, M. R. Smith and T. M. Ferguson.

American Bolt Corporation, Boss Nut Division, Chicago.—Bolts, rivets and lock nuts. Represented by J. W. Fogg, A. W. Maclean, T. W. Callahan, J. A. Maclean and H. R. Davies.

American Brake Shoe and Foundry Company, New York.—Represented by J. W. Waters, Charles F. Weil, and Fred P. Biggs.

American Locomctive Company, New York.—Power reverse gear and model of 3-cylinder locomotive. Represented by G. P. Robinson, G. G. Jones, Arthur Haller, C. D. Rogers, R. Brown and W. A. Draper.

American Railway Appliance Company, New York.—Locomotive flue blower. Represented by A. Schneider and L. D. Brown.

American Steel Foundries, Chicago.—Models of integral box side frame, couplers, vertical key yokes, coupler pockets, reversible strut brake beams, draft arms, cast steel bolsters and cast steel wheels. Represented by W. G. Wallace, W. C. Walsh and P. A. Martin.

Ar-An-Esa Manufacturing Company, Chicago.—Pneumatic fire door. Represented by E. H. Bauer.

Ashton Valve Company, Boston, Mass.—Safety valves, air and steam gages, locomotive driving wheel quartering gages, dead weight testers and steam and air gage testing outfits. Represented by H. O. Fetinger and J. F. Gettrust.

B-S Manufacturing Products Corporation, Jersey City, N. J.—Locomctive automatic drifting valve, quick action steam valve and self-lubricating packing box. Represented by H. O. Wittpen and R. W. Braden.

Badeker Manufacturing Company, Chicago.—Metallic piston rod, valve stem packing, hub liner, bell ringer and air pump lubricating cup. Represented by J. W. Stack, J. P. McKinley and E. Lea.

Baldwin Locomotive Works, Philadelphia, Pa.—Represented by R. L. Schlacks, W. H. Evans, F. Neely and C. H. Kaskill.

Barco Manufacturing Company, Chicago.—Power reverse gear, metallic car connections, metallic engine and tender connections, crosshead, smoke box blower fittings, yard and station steam heat connections, blower and blow off connections for roundhouse, flexible joints (for air reservoirs, distributing valves and headlight dynamos), lubricated plug valves, etc. Represented by F. N. Bard, C. L. Mellor, A. S. Lewis, F. H. Stiles, W. J. Behlke, C. O. Jenista and F. B. Nugent.

The Bird-Archer Company, New York.—Anti-pitting and anti-scaling compounds. Represented by J. L. Callahan, J. J. Clifford, C. J. McGurn, T. A. Peacock, L. F. Wilson, J. A. McFarland and K. Alten.

Bradford Corporation, New York.—Locomotive throttle valve, draft gears, Huntoon brake beams and bolsters. Represented by E. J. Barnett, J. C. Keene, A. C. Bodeau, G. W. Bender and R. W. Chambers.

Morris B. Brewster, Inc., Chicago.—Metallic packing and forzoil oil can. Represented by M. B. Brewster and John Ash.

Crane Company, Chicago.—Railroad valves and fittings. Represented by F. W. Venton and H. J. Bartlett.

Dearborn Chemical Company, Chicago.—Literature. Represented by I. H. Bowen, L. P. Bowen, O. H. Rehmeyer, Joe Arn, Geo. R. Carr, J. D. Purcell, F. W. Cooley, C. M. Hoffman, G. P. Ross and C. S. Murray.

Detroit Lubricator Company, Detroit, Mich.—Bullseye locomotive lubricator, automatic flange oiler, automatic exhaust nozzle cover and transfer filler. Represented by A. C. Machesney, S. A. Witt and C. L. Butler.

Diamond Power Specialty Corporation, Detroit, Mich.—Locomotive soot blower and parts. Represented by I. S. Forde and E. K. Ube.

Distance Speed Recording Company, Roselle, N. J.—Speed recorder, cut-off indicators and recorders. Represented by J. E. Matthews and G. B. Dobyns.

Duff Manufacturing Company, Pittsburgh, Pa.—Jacks. Represented by E. E. Thulin and C. N. Thulin.

Edna Brass Manufacturing Company, Cincinnati, Ohio.—Force feed lubricator, hydrostatic lubricator, water column, injectors and boiler checks. Represented by H. A. Glenn, F. S. Wilcoxen and E. O. Corey.

Electric Service Supplies Company, Philadelphia, Pa.—Turbo generators and locomotive headlights. Represented by F. M. Childs, B. D. Barger and J. C. Bryan.

Elvin Mechanical Stoker Company, New York.—Pamphlets. Represented by J. R. Davis and H. D. Eckerson.

Foster Engineering Company, Newark, N. J.—Automatic valves and Foster flexible joint. Represented by C. A. Olson and Frank Barry.

Franklin Railway Supply Company, New York.—Locomotive tender booster, power reverse gears, unit safety drawbar and radial buffer, lateral motion driving box, adjustable wedges, driving box lubricator, driving box spreader, removable driving box and telescopic fire door. Represented by H. F. Ball, W. H. Coyle, J. L. Randolph, H. M. Evans, C. W. Floyd Coffin, W. T. Lane, P. Weiler, S. D. Rosenfelt, P. Willis, T. L. Reed, J. A. Talty, T. P. Whalen, J. L. Bacon, F. H. Cunningham, A. M. Meston, J. A. Berger, C. H. Godfrey and H. S. Vincent.

Galena Signal Oil Company, Franklin, Pa.—Represented by A. S. Poole, G. E. McVicar, V. L. Eubank, W. F. Walsh, F. C. Langdon, L. G. Palmer, C. McNair, J. F. Wilsey, F. B. Smith, W. O. Taylor, R. A. Green, J. S. Brown, B. C. Corey, L. E. Drukey and W. J. Walsh.

Garlock Packing Company, Palmyra, N. Y.—Fibrous packings for general railway use and metal air pump packing. Represented by C. W. Sullivan and R. J. Hinkle.

Garratt Callahan Company, Chicago.—Catalogues of boiler preservative. Represented by A. H. Hawkinson, W. F. Coopers, G. J. Barclay, J. W. Place, W. F. Caspers and H. M. Gray.

Gill Railway Supply Company, Peoria, Ill.—Cooling compound, hot box compound, cutting lubricant, emergency hose clamp, boiler preservative, adjustable driving box bearing and locomotive adjustable driving box. Represented by E. H. Hartenstein, Wm. O'Brien, F. Pinkney, S. S. Pinkney, J. O. Gill and D. H. French.

Hanna Stoker Company, Cincinnati, Ohio.—Stokers. Represented by F. K. Tutt, G. D. Peberall and W. T. Hanna.

Hulson Grate Company, Keokuk, Iowa.—Locomotive grate. Represented by A. W. Hulson, J. W. Hulson and J. E. Vrooman.

Hunt Spiller Manufacturing Corporation, Boston, Mass.—Valve bullrings, piston heads, piston bullrings, crosshead shoes, cylinder packing, piston packing, cylinder bushings and cylinder packing, air pump bushings, shoes and wedges, and floating rod bushings. Represented by J. G. Plant, V. W. Ellet, E. J. Fuller, Charles Galloway, R. R. Wells and F. B. Hartman.

Huron Manufacturing Company, Detroit, Mich.—Wash-out and arch tube plugs. Represented by E. H. Willard, H. N. Reynolds and G. L. Harner.

International Correspondence Schools, Railroad Division, Scranton, Pa.—Railway correspondence courses. Represented by J. W. Harding, E. N. Sawyer and H. T. Pettinger.

Jenkins Brothers, New York.—Valves. Represented by George Royal and C. B. Yardley.

Johns-Manville, Inc., New York.—Pipe and boiler insulation, locomotive and shop packings and gaskets, steam traps and high temperature cement. Represented by J. C. Younglove, P. C. Jacobs, H. J. Crowe, L. S. Wilbur, P. R. Austin, F. C. Vandervort, Jr., and A. H. Purdom.

King Refractories Company, Inc., Buffalo, N. Y.—Air set cement and pamphlets. Represented by A. J. Frett.

The Leslie Company, Lyndhurst, N. J.—Turbo generator and steam heat pressure regulators and reducing valves. Represented by J. J. Cizek.

Lima Locomotive Works, Inc., Lima, Ohio.—Represented by M. K. Tate and G. M. Basford.

Locomotive Finished Material Company, Atchison Kans.—Universal sectional cylinder packing. Represented by C. Hastings and R. L. McIntosh.

Locomotive Firebox Company, Chicago.—Thermic syphon and sectional model fire box. Represented by A. A. Taylor, L. R. Pyle, E. J. Reardon, J. L. Nicholson, W. S. Carr, J. A. Baker, C. A. Seeley, C. M. Rogers, A. M. Wheeler and B. E. Larson.

Locomotive Stoker Company, Pittsburgh, Pa.—Working model of locomotive stoker. Represented by A. N. Willsie, E. F. Milbank, Thomas Baldwin, C. F. Kahler, H. C. Woodbridge, J. J. Hannahan, A. L. Whipple, O. B. Capps, R. G. Kelley, L. V. Stevens, W. T. Sapps, J. J. Byrne and H. C. Houston.

Madison-Kipp Corporation, Madison, Wis.—Two and four-feed force feed lubricators. Represented by W. B. Wheeler, A. H. Flanagan, J. A. Coleman, T. A. Coleman and J. M. Borrowdale.

Mahr Manufacturing Company, Minneapolis, Minn.—Rivet heating forges and torch outfits. Represented by W. G. Barstow and B. G. Harmon.

Manning, Maxwell & Moore, Inc., New York.—Valves, inspirators, safety valves and gages. Represented by C. L. Brown, C. W. Corning, J. Soule-Smith, P. H. Ryan, J. P. Walsh and J. H. Bush.

Metal & Thermit Corporation, New York.—Pipe welding, superheater unit, rail welding, locomotive frame sections. Represented by H. S. Mann and W. H. Moore.

W. H. Miner, Inc., Chicago.—Models of friction draft gear, side bearings, cast steel yoke and safety bolster locking center pin. Represented by B. S. Johnson and W. A. Berger.

Nathan Manufacturing Company, New York.—Lubricators, injectors, boiler checks, water columns, mechanical lubricators, hydrostatic lubricators, low water alarm, blow-off cocks, stationary pump globe and angle valves. Represented by J. E. Brandt, Richard Welsh, W. R. Walsh, F. C. Davern and T. J. Murphy.

National Boiler Washing Company, Chicago.—Literature. Represented by S. W. Gale, F. S. Wichman and T. G. Dalton.

National Malleable and Steel Castings Company, Cleveland, Ohio.—Couplers, coupler pocket, draft gear and wrecking hook. Represented by G. R. Rasmussen.

National Railway Devices Company, Chicago.—Radial and vertical fire doors. Represented by E. J. Gunnison.

National Safety Appliance Company, San Francisco, Cal., and Chicago.—Working model of train control apparatus. Represented by K. E. Kellenberger, J. P. Robinson, E. W. Stone, E. C. Wilson and J. C. Anderson.

National Tube Company, Pittsburgh, Pa.—Tubes. Represented by G. N. Riley, J. W. Kelley and P. J. Conrath.

New York Air Brake Company, New York.—Represented by L. W. Sawyer, E. F. Wentworth and Howard T. Wentworth.

Ohio Injector Company, Chicago.—Lifting and non-lifting injectors, hydrostatic lubricators, automatic flange oiler, automatic drifting valve, low water alarm, boiler check and Ohio stop valve, injector hose strainer, fire jet and water glass protector. Represented by A. C. Beckwith, F. W. Edwards, F. B. Farnsworth, W. H. Malone and C. G. Sauerburg.

Okadee Company, Chicago.—Blow-off valve, automatic cylinder cock, front end hinges, water glass protectors and tender hose coupler. Represented by A. G. Hollingshead, G. S. Turner, W. H. Heckman, H. Vissering, J. M. Monroe and J. S. Lemly.

Oxweld Railroad Service Company, Chicago.—Oxyacetylene gas and welding and cutting equipment. Represented by William Leighton, A. N. Lucas and C. S. Wright.

Paige-Jones Chemical Company, New York.—Chemicals. Represented by C. E. Foyle, C. B. Flint and R. E. Falkinburg.

Parkesburg Iron Company, Parkesburg, Pa.—Charcoal iron boiler tubes. Represented by J. F. Wiese and L. P. Mercer.

Paxton-Mitchell Company, Omaha, Nebr.—Piston rod, valve stem and air pump metallic packings. Represented by James Paxton, E. L. Chollman, L. J. McConnel and N. J. Malloy.

Pilliod Company, New York.—Valve gears. Represented by W. H. Bellmaine, J. H. Cooper and Frank Fisher.

Pilot Packing Company, Inc., Chicago.—Semi-metallic packing, grease lubricater, locomotive drifting valve and grease cup. Represented by Joseph Sinkler, Robert Sinkler and E. F. Boyle.

Publishers Association.—Copies of the Constructor. Represented by H. Stopeck.

Pyle-National Company, Chicago.—Turbo generators, air tight sheet metal and cast aluminum alloy headlight cases with copper silver plated reflectors and non-glass mirror reflectors, flood lights, Young valve gear, car and locomotive electric lighting accessories. Represented by J. Will Johnson, William Miller, George Hass, W. T. Bretherton, Walter Smith, O. W. Young and R. L. Kilker.

Railway Age, Chicago.—Copies of Railway Age and Railway Mechanical Engineer. Represented by E. L. Woodward, J. C. Emery, G. W. Daves and R. F. Duysters.

Railway Journal, Chicago.—Copies of Railway Journal. Represented by E. C. Cook and S. O. Rosenfeld.

Railway Review, Chicago.—Copies of Railway Review. Represented by J. A. Walsh and L. R. Wolff.

Sargent Company, Chicago.—Water column, safety water glass protector, wire glass front protectors, two seat gage cocks, blower valves, safety gaskets and hydrostatic lubricator. Represented by L. L. Schultz and G. H. Sargent.

Standard Stoker Company, New York.—Working model of locomotive stoker. Represented by C. T. Hansen, S. I. McQuilken, F. P. Roesch, H. C. Oviatt, J. T. Markham, R. L. Belknap and L. F. Sweeny.

Sunbeam Electric Manufacturing Company, Evansville, Ind.—Air tight headlight and turbo generator. Represented by H. A. Varney.

Superheater Company, New York.—Feed water heater and photographs of locomotives equipped with superheaters and feed water heaters, and exhaust steam injector. Represented by G. L. Bourne, F. A. Schaff, R. M. Osterman, G. E. Ryder, H. B. Oatley, C. H. True, A. C. Loudon, R. R. Porterfield, Bard Browne, W. A. Buckbee, George Fogg, John E. Mourne, B. G. Lynch, S. Macdonald, K. E. Stilwell, A. C. McLachlan, C. M. Wickham, George Dolan, W. G. Tawse, L. H. A. Weaver, I. D. Toner, E. J. Drewyour, N. T. McKee, C. A. Odell, H. C. Bell, and C. R. Fairchild.

Talmadge Manufacturing Company, Cleveland, Ohio.—Low water alarm, blow-off valve and boiler cleaner. Represented by F. M. Roby and H. B. Thurston.

Texas Company, New York.—Pamphlets and oils. Represented by W. L. Gibbs, E. S. Freeman, H. L. K. Malette, James H. Wood, J. F. Ryan, L. E. Giffen, W. B. Blackwell, C. J. Quinn and A. D. Pendergast.

Torchweld Equipment Company, Chicago.—Cutting and welding equipment. Represented by J. L. Jensen, R. M. Smith and J. M. Cameron.

Transportation Devices Corporation, Indianapolis, Ind.—Power reverse gear automatic cut-off control device. Represented by E. S. Pearce, W. R. Beck, George Brown, E. C. Karibo, F. H. Lutz and W. C. Miner.

United States Metallic Packing Company, Philadelphia, Pa.—Air pump, piston and valve stem packings, oil cup, shaker bar, locomotive sanders and bell ringer. Represented by J. T. Luscombe, J. C. Weedon, H. E. Hyslop, R. A. Light, L. B. Miller, Charles Thomas and John Mace.

Universal Packing & Service Company, Chicago.—Spring journal box packing. Represented by J. P. Landreth, W. H. Davis and Walter Gibbs.

Vapor Car Heating Company, Chicago, Steam heat pressure reducing valve and locomotive stop valve. Represented by N. E. Burns and L. B. Rhodes.

Harry Vissering & Company, Chicago.—Metallic packing and locomotive sanders. Represented by G. S. Turner, W. H. Heckman, H. Vissering, J. M. Monroe, A. D. Hollingshead and J. S. Lemley.

Westinghouse Air Brake Company, Pittsburgh, Pa.—Draft gear, packing cups, pressure head gaskets, automatic air cylinder oil cups, air strainer, leakage indicator, centrifugal dirt collector and flanged union. Represented by J. B. Wright, C. J. Olmstead, W. M. Sleet, A. G. Huston, J. S. Y. Fralich, E. A. Maylock, H. H. Burns, A. L. Berghane, F. B. Johnson, R. I. Cunningham, C. D. Foltz, F. H. Parke, Lawrence Wilcox, E. H. Weaver, M. H. Burchard, J. R. Holden, F. B. Farmer, C. E. Smith, R. O. Yearick, L. M. Carlton, Thos. G. Nyles and H. L. Fuller.

White American Locomotive Sander Company, Inc., Roanoke, Va.—Locomotive sander with duplex operating valve, spreader for sand box and automatic sander for boosters. Represented by James Frantz and W. L. Ransom.

William Sellers & Company, Inc., Philadelphia, Pa.—Locomotive injectors, valves and accessories, and boiler checks. Represented by Phillip E. Raymond and James R. New.

Worthington Pump & Machinery Corporation, New York.—Locomotive feed water heater. Represented by J. M. Lammedee, J. E. Buckingham, G. P. Schumacker, Jr., S. N. Morse, George Lumbert, D. W. Dimmock, C. E. Berglund, E. C. Jackson, W. Christianson, W. F. Sampson and S. N. Cosgrove.

Traffic News

The San Antonio & Aransas Pass is sending out a corps of experts to urge the farmers along the line to co-operate to exterminate the boll weevil.

The Chicago & Alton will give a prize for the best description and story on the new Alton Limited train to high school pupils of Bloomington, Ill., and Normal. The article must not exceed 500 words and each entrant must deliver his production to the principal of his high school not later than October 15.

The Merchants' Limited of the New York, New Haven & Hartford, between New York and Boston, leaving either city at 5 p. m., henceforth will run Sundays as well as weekdays. New time tables, discontinuing schedules made to accommodate the use of sixtieth meridian time during the summer, go into effect on Sunday, September 28.

The Arkansas Railroad Commission on September 17 sent to the Texas, Oklahoma and Missouri commissions, and to the Interstate Commerce Commission, a protest against the discontinuance by the St. Louis-San Francisco of two trains operating between St. Louis, Mo., and Paris, Tex., asking that the discontinuance be delayed until a joint hearing can be held by the state and federal commissions.

The Great Northern will distribute a carload of registered Holstein bulls to farmers in Montana and western North Dakota to aid in establishing more profitable farming in the territory it serves by stimulating the dairy industry. Distribution of the bulls will begin on September 29 and will be completed in three weeks. Meetings for the discussion of dairying will be held at each community where a bull is to be placed. The bull will be given to the farmer selected by the local committee of citizens and will be the property of the farmer selected. It will be kept by the farmer to be used in his own herd and for the use of his neighbors at a nominal fee. A contract with the farmer will provide that the bull shall not be sold or otherwise disposed of within three years but at the end of that period may be exchanged for another bull of like breeding.

Chicago-St. Louis Speed Competition

The competition for passenger traffic between Chicago and St. Louis has become so keen that three roads have cut their fastest schedules to 6½ hours and have placed in service new cars embracing a number of innovations. Following the action of the Chicago & Alton with the Alton Limited as reported in the *Railway Age* of September 20, the Illinois Central reduced the time of its Daylight Special to 6½ hours or 1¼ hours below the old schedule. The train now leaves Chicago at 11:45 a. m. and arrives at St. Louis at 6:15 p. m. On the same day a new all-steel train was put on to leave Chicago at 9 a. m. and arrive at St. Louis at 4:43 p. m. The equipment of the Daylight Special includes parlor cars, dining car, chair cars and coaches. With the announcement of the Illinois Central, the Chicago & Alton changed the effective date of its new schedule to September 23. Following this the Wabash announced the installation of new all-steel cars on its Banner Limited and reduced its schedule to 6½ hours, effective September 21. Under the new schedule this train leaves Chicago at 11:30 a. m. and arrives at St. Louis at 6:15 p. m. The equipment consists of observation-parlor car, vestibule-parlor car, dining car, reclining chair car and smoking car. The action of the Wabash caused the other roads to put their schedules into effect on September 21.

Review by Car Service Division

Present demands for transportation are being fully met without difficulty by the rail carriers of the country, according to the report of the Car Service Division submitted to the Board of Directors of the American Railway Association on September 19.

"The roads in the three western districts have 102.4 per cent of their ownership of box cars on line, the best location of box car equipment that has ever existed, so far as the records of the Car Service Division disclose. The western movement of empty box cars through Chicago and St. Louis has averaged, since May 4, 813 per day of western ownership. It is believed that the movement of agricultural crops will be taken care of without difficulty this year.

"All demands for refrigerator cars for the movement of perishable traffic have also been met. It is anticipated that the peak movement from California will occur about the last week of September and the first week of October. According to the latest figures available, which are those for September 1, the Santa Fe and the Southern Pacific had on their lines 32,778 refrigerator cars, which is an increase of 7,021 cars over the number they had on hand last year. On the Santa Fe and the Southern Pacific lines during August, 20,311 cars of perishable freight were loaded, and during this period the cars available in California for immediate loading increased 5,348 cars, indicating very clearly that there is a prompt return movement, and, in addition, they have been assisted with railroad-owned cars and refrigerator cars of other private line car companies. All railroads have been asked to specialize on the return movement of refrigerators owned by the California lines."

The report showed that on September 1, freight cars in need of repairs totaled 210,109, or 9.2 per cent of the number on line, compared with 175,327, or 7.7 per cent, on the same date last year. Of locomotives, 15 per cent of the number on line were in need of heavy repairs, compared with 14.7 per cent last year, and 1.9 per cent awaited light repairs, compared with 1.8 per cent last year.

Surplus freight cars in serviceable condition on September 1, totaled 231,677, compared with 66,559 on the same date last year.

The railroads report, from the first of the year to September 6, inclusive, a decrease of 1,606,782, or 4.7 per cent, in the number of cars loaded with revenue freight compared with the corresponding period last year. Loading of grain, however, shows an increase of 8.5 per cent, the main reason for a falling off being due to declines in the loading of coal, coke and ore. Coal alone shows a decrease of 1,071,751 cars, or 16.1 per cent; coke, 32 per cent, and ore nearly 27 per cent.

The New Haven's New York City Passenger Traffic

To educate the public in railroad economics the New York, New Haven & Hartford posts large placards in its passenger cars, a recent series of six placards dealing with suburban fares.

Following are extracts from these:

Of the 325,000,000 people entering and leaving New York City in 1923, 38,360,362 were passengers through the Grand Central Terminal and 17,101,767 entered and left New York over the New Haven.

Ten years ago there was some reserve capacity; today the number of trains that can enter and leave the Grand Central Terminal has substantially been reached during rush hours.

The passengers carried into New York by the New Haven may be divided into three classes:

1. Those riding at standard rates.
2. Those riding daily on commutation tickets.
3. Those who ride frequently on 25 or 50 trip tickets.

So long as the percentage of classes 2 and 3 are a small part of the total, the standard rate earnings may be sufficient to bear any loss from commuter riding.

In 10 years Class 1 passengers have increased 28.8 per cent.

In 10 years Class 2 passengers have increased 108.7 per cent.

In 10 years Class 3 passengers have increased 253.1 per cent.

As against the tremendous increase in passengers in classes 2 and 3, commuter rates in New York have increased but 10 per cent.

The burden, therefore, has become too great for Class 1 riding to bear.

Because of the convenient location of the Grand Central it has been possible to devote large portions to commercial uses. Notwithstanding the considerable profits from these sources, the Grand Central is expensive to operate. After crediting all revenues of the terminal, the cost per passenger handled in 1923 was 19.2 cents.

It is obvious that from the present low commuter fares practically nothing is left, after paying terminal costs, etc.

In the ten years during which New York commuter rates have increased but 10 per cent, manufacturing costs have increased about 100 per cent. In the same period the income from the sale of other forms of transportation has increased about 50 per cent. To furnish adequate service and facilities it has become necessary to ask that the commuter travel be more nearly self-supporting.

* * *

Commission and Court News

Interstate Commerce Commission

Argument on Southern Class Rate Investigation Postponed

Commissioner Eastman, of the Interstate Commerce Commission, has issued a notice that it will not be practicable to have oral argument on the Southern class rate investigation proceeding in October as had been expected because of delay in completing a traffic test covering the month of April to ascertain as nearly as may be the revenue effect of the rates recommended in the proposed report. Regarding the magnitude of the work involved in this test Commissioner Eastman says:

"I have now been informed by the carriers that the computation of mileages and rates covering all the traffic, both intraterritorial and interterritorial, which moved in the month of April, has proved so great a task that the results of the traffic test will not be available prior to December 1, 1924. Representatives of the commission have been in touch with the work on this traffic test, and I am convinced that the delay has not been due to lack of diligence upon the part of the carriers. The following statement from the carriers' Fourth Section Committee is of interest in this connection:

"'Not only have our regular forces engaged in this work, but we have employed all other available men, drawing for that purpose upon the personnel of the Southern Freight Association as well as the general and local freight offices located in Atlanta. On this work we have employed 96 clerks, with a monthly payroll of $8,945. This does not take into account the Fourth Section Committee whose members' salaries and expenses are paid by individual lines, nor does it include clerks employed on the work in the individual traffic and accounting offices of our principals.

"'To afford some idea of the tremendous character of the task, it may be mentioned that we have furnished the auditors with 846 mimeographed pages containing constructive distances or rates. Incidentally, we have used over one million sheets of mimeograph paper in our work on this case since the receipt of the tentative report. Because of the complicated basis for interterritorial rates, we have been compelled in the interest of accuracy to calculate them in this office, and have received from the auditors requests for 175,000 such rates.'"

I. C. C. and Shipping Board Asked to Give Joint Consideration to Port Differentials

A request for joint consideration by the Interstate Commerce Commission and the United States Shipping Board, as co-ordinate agencies of the federal government vested with complementary powers over rail and ocean rates, of the cases now pending before the two commissions involving complaints against the present export and import rates and differentials through the various gulf and Atlantic ports, has been filed by Clark & La Roe as counsel for the Port of New York Authority and also for various New England ports. Permission is requested to appear before the liaison committee of the Shipping Board and the commission in support of the petition. The cases in which joint consideration is requested include the so-called port differential cases, filed on behalf of the New England ports, alleging that export and import rates on classes and commodities are unduly prejudicial to the New England ports and preferential of other ports. The South Atlantic and gulf ports intervened and called the commission's attention to their disadvantage in through rates due to differentials in ocean rates. The Traffic Association of the South Atlantic Ports has also filed a complaint against the rail carriers alleging that the import freight rates from the South Atlantic ports to the territory west of Buffalo and Pittsburgh are unreasonable and unduly prejudicial to the extent that they exceed the corresponding import rates from Baltimore. The South Atlantic ports also in another proceeding have complained against the relationship of export rates to the South Atlantic ports as compared with the North Atlantic ports. The Shipping Board, after receiving complaints on behalf of the South Atlantic ports and the Norfolk Port Commission, in which cases the North Atlantic and Gulf ports have intervened, has instituted a formal investigation into the rates and charges applicable from Atlantic and Gulf ports to points in foreign countries and also into the differentials involved.

The petition filed with the two bodies states that no part of the nation's rate adjustment has caused such widespread dissatisfaction over a period of many years or has resulted in more litigation than that involving the export and import rates, and that no satisfactory solution will be found until the situation is dealt with in a broad manner commensurate with the importance and aggravated character of the discriminations complained of. An equalization of the ocean rates as to which the export rates are now equalized, it is contended, would place all the ports on a substantial rate parity and quiet for all time, as to these ports, the differential controversies.

Hearings on Mileage Books

Hearings in the Interstate Commerce Commission's interchangeable mileage ticket investigation were resumed before Commissioner Meyer and Examiner Sweet at Washington on September 24, the commission having reopened the case after its order to the railroads to issue scrip coupon books having a face value of $90 for $72 had been enjoined by the courts. Examiner Sweet stated that the controversy has now apparently narrowed down to the question of what is a just and reasonable rate for the mileage or scrip coupon books which the commission is directed by law to prescribe and that the commission desires the assistance of the parties on that point. The railroads at the previous hearings had taken the position that the present scrip coupon books sold at the standard rate are in compliance with the law and their only testimony at this hearing was given by L. E. Wettling, manager of the statistical bureau of the western railroads, who presented statistics regarding the passenger traffic of the roads and their earnings, showing that they are still far below the percentage of return contemplated by the transportation act. Frank J. Warne, as a witness for the commercial travelers' organizations, presented an analysis of railroad statistics to show that their return has been reduced by abnormal expenses in recent years and that the expenses are now coming down. He also went into a discussion to show that a reduced rate for mileage books would not be discriminatory against passengers in general.

Personnel of Commissions

Harrison A. McKeown, of the Supreme Court of the province of New Brunswick, was last week appointed by the dominion government as chairman of the Dominion Board of Railway Commissioners to succeed the late Frank B. Carvell. Judge McKeown has for many years held a prominent place in the public life of New Brunswick. Previous to his elevation to the Bench of that province he was prominent in politics. He was born in St. Stephen, N. B., in 1863, and became a member of the legislature when 27 years of age. Later he held the position of attorney-general in the government of New Brunswick. He was named by the dominion government a royal commissioner to inquire into the affairs of the defunct Home Bank of Canada at Toronto last winter. His conduct of that inquiry won for him a wide esteem in the dominion.

State Commissions

The Railroad Commission of California is to conduct an investigation into the reasonableness of the rates, regulations, and practices of the various auto ferries operating in the San Francisco Bay district. Hearings have been set by the commission on this investigation before Commissioner Egerton Shore as follows: Golden Gate Ferry Company on October 6; Northwestern Pacific Railroad Company on October 7; Southern Pacific on October 9; Richmond and San Rafael Ferry and Transportation Company on October 13; Rodeo-Vallejo Ferry Company on October 14; and Martinez-Benicia Ferry and Transportation Company on October 15. All hearings will be held in the courtroom of the commission in San Francisco.

Equipment and Supplies

Locomotives

MINNEAPOLIS & ST. LOUIS—See item under Freight Cars.

THE NEW YORK CENTRAL is inquiring for 10 Pacific type locomotives.

THE OWEN OREGON LUMBER COMPANY has ordered one Mikado type locomotive from the Baldwin Locomotive Works.

Freight Cars

THE ATLANTIC COAST LINE is reported to be inquiring for 3,000 freight cars.

THE BALTIMORE & OHIO is expected to enter the market for 8,000 freight cars.

THE RIO GRANDE DO SUL (Brazil) is inquiring through the car builders for 15 flat cars.

THE CHICAGO, BURLINGTON & QUINCY is reported to have authorized the purchase of 3,000 freight cars.

THE ULEN CONTRACTING COMPANY, New York, has ordered five tank cars of 5,000 gal. capacity from the Magor Car Corporation.

THE JEDDO HIGHLAND COAL COMPANY, Jeddo, Pa., has ordered an additional 30-yd., air-operated, extension side dump car, from the Clark Car Company.

THE GREAT NORTHERN is inquiring for 250 ore cars of 75 tons' capacity and is asking for prices on miscellaneous parts for repairs to several thousand box cars.

THE PERE MARQUETTE, reported in the *Railway Age* of August 3 as inquiring for 34 caboose underframes, has ordered 12 underframes from the Pressed Steel Car Company.

NORFOLK & WESTERN.—At board of directors meeting, September 23, expenditures for construction of 1,000 all steel gondola cars of 57½ tons' capacity, at Roanoke shops were authorized.

THE CHICAGO, INDIANAPOLIS & LOUISVILLE, reported in the *Railway Age* of August 9 as inquiring for 250 underframes has ordered this equipment from the Pullman Car & Manufacturing Corporation.

THE UNION CARBIDE COMPANY, reported in the *Railway Age* of August 9 as inquiring for from 4 to 8 tank cars, has ordered from the General American Tank Car Corporation 6 special tank cars of 40 tons' capacity.

THE ST. LOUIS SOUTHWESTERN was reported in the *Railway Age* of September 13 as having placed an order with the American Car & Foundry Co., for 1,000 box cars of 40 tons' capacity. The *Railway Age* is advised by the railroad that the above information as to placing an order for these cars is incorrect.

THE READING which was reported in the *Railway Age* of September 6 as inquiring for 1,000 box cars and 1,000 gondola cars, has ordered these cars as follows: 500 box cars of 50 tons' capacity from the American Car & Foundry Company, and the same from the Standard Steel Car Company; 500 gondola cars of 70 tons' capacity from the Pressed Steel Car Company and the same from the Bethlehem Steel Corporation.

M. & St. L. Rehabilitation Plan Provides for Large Equipment Orders

Under the rehabilitation plan for the Minneapolis & St. Louis as filed by the receiver in the federal court the following equipment will be purchased: 20 locomotives, 10 passenger coaches, 100 refrigerator cars, 500 gondola cars, 200 flat cars, 1,000 box cars and several motor coaches.

Passenger Cars

MINNEAPOLIS & ST. LOUIS—See item under Freight Cars.

THE ILLINOIS CENTRAL, reported in the *Railway Age* of August 23 as inquiring for 200 express refrigerator cars, has ordered this equipment from the American Car & Foundry Company.

Iron and Steel

THE READING is inquiring for 30,000 tons of rail.

THE VIRGINIAN is inquiring for 24,000 tons of rail.

THE BALTIMORE & OHIO is inquiring for 60,000 tons of rail.

THE ERIE has ordered 375 tons of structural steel from the American Bridge Company.

THE GREAT NORTHERN has ordered 10,000 tons of rail from the Bethlehem Steel Company.

THE ILLINOIS CENTRAL is inquiring for 2,500 tons of structural steel for catenary bridges for its suburban electrification.

THE CHESAPEAKE & OHIO has ordered 5,000 tons of rail from the Inland Steel Company, 5,000 from the Illinois Steel Company, and 2,300 tons from the Bethlehem Steel Company.

Machinery and Tools

THE ERIE has placed an order for a 48-in. car wheel borer.

THE CHESAPEAKE & OHIO is inquiring for 40 machine tools.

THE SOUTHERN PACIFIC has placed an order for a flanging clamp.

THE ATCHISON, TOPEKA & SANTA FE has placed an order for a 90-in. locomotive journal turning lathe; an order was also placed for a car wheel lathe.

Miscellaneous

THE NORTHERN PACIFIC has placed an order with the Oneida Manufacturing Company, Green Bay, Wis., for the installation of power units on a combination car.

Signaling

THE NEW YORK CENTRAL has placed an order with the General Railway Signal Company for one 96-lever Style A mechanical interlocking machine for installation at Calumet, Ind. This machine will have 75 working levers and 21 spare spaces.

THE FLORIDA EAST COAST has awarded a contract to the General Railway Signal Company covering the complete installation of an electric interlocking plant at its St. Johns river drawbridge, Jacksonville, Fla. This machine will have 8 working levers; the order also includes six 2-indication light signals and four smash-boards operated by Model 2A mechanisms.

THE NEW YORK CENTRAL, Ohio Central lines, has placed an order with the General Railway Signal Company for one 8-lever Saxby & Farmer interlocking machine arranged for horizontal lead-out with seven working levers and one spare space for installation at Fultonham, Ohio. The order also includes 10 Model 5 switch circuit controllers and 8 Model 9D indicating relays.

NEARLY 4,000,000 tons of coal were transferred from cars to lake boats at the Toledo docks of the Hocking Valley during the months of May, June, July and August. The tonnage transfers by months are as follows: May, 1,026,161 tons; June, 888,671 tons; July, 863,000 tons; August, 960,556 tons. Loadings in September are expected to be in excess of 800,000 tons. The news item in the *Railway Age* of August 30, which described the loading of 682,355 tons at the Sandusky, Ohio, coal dumping dock of the Pennsylvania as next to the highest record for all lake ports, was a record only for Pennsylvania docks.

Supply Trade News

The Economy Fuse & Manufacturing Company, Chicago, has removed its Minneapolis district sales office to 1008 Marquette avenue, Minneapolis, Minn.

J. W. Blackford has joined the sales force of the **Torrington Company,** Torrington, Conn. Mr. Blackford will handle the sale of that company's Dayton swaging machines and Torrington ball bearings.

The George M. Kenyon Company, 116 East Fourth street, St. Paul, Minn., now represents the **Hanna Engineering Works,** Chicago, in the states of Minnesota, North Dakota, South Dakota, Iowa and the eastern portion of Nebraska.

The Union Railway Equipment Company, Chicago, on September 16 discontinued its sales arrangement with the Commonwealth Supply Company, Richmond, Va., and in future all sales in the southeastern territory will be handled direct from the general office, Chicago.

H. T. Heath has been appointed western department manager of the **Hegeman-Castle Corporation** of Chicago, owned and controlled by the **National Railway Appliance Company** of New York. Mr. Heath graduated from the Ohio State University in 1911, with degrees of M.E. and E.E. He served with the Westinghouse Electric & Manufacturing Co. for six and one-half years and joined the Economy Electric Devices Company in 1917 as sales representative of the middle west and southwestern territory.

F. R. Hopper, western manager of the **Concrete Steel Company,** with headquarters at Chicago, has been transferred to Kansas City, Mo., as district manager, where he will be in charge of the company's business in Nebraska, Kansas, Oklahoma, western Iowa and western Missouri. **C. A. Lord,** district manager at Kansas City, has been transferred to Chicago. The position of western manager has been abolished and the Chicago, St. Paul and Kansas City district sales offices will report direct to the general office in New York. The Omaha branch office will report to the Kansas City district sales office.

Correction

The statement published in the *Railway Age* of September 13 to the effect that the Railway Improvement Company, New York, has taken over the manufacture and sale of various products of the Railway Supply Company, Chicago, is incorrect in that it included the Peerless side bearing, as the Continental Railway Supply Company has in no way anv interest in the Peerless side bearing.

Pullman Company Issues Annual Report

The annual report of the Pullman Company for the fiscal year ended July 31, 1924, shows a gross revenue of $81,240,688 which is the maximum in the history of the company. The net income from sleeping car business for the year was $7,698,636 and returns from the manufacturing car business $7,904,426, making a total net income of $15,603,062. Reserves of $2,000,000 for pensions and replacements left an income available for dividends of $13,603,062, equal to $10.06 a share on the 1,350,000 shares of capital stock outstanding, as compared with a rate of $9.79 a share in 1923. After paying dividends amounting to $10,703,221 during May the surplus earnings of $2,889,841 brought the net surplus up to $26,687,475.

In May the company brought about a corporate segregation of the common carrier and the manufacturing branches of business and transferred to the newly created corporation, the Pullman Car Manufacturing Corporation, all of the assets and business of the manufacturing department, receiving in exchange the entire $50,000,000 capital stock of the latter corporation which is carried in the balance sheet at the original investment cost of $36,779,464. Returns from the manufacturing department for the period prior to the sale to the new company are included in the annual report of the Pullman Company.

The items of cash, government bonds and certificates of indebtedness held in the treasury amount to $32,618,344 in addition to which holdings of other bonds, stocks, and car trust notes at a market value in excess of $15,000,000, make the total value of cash and securities held $47,618,341. The cash and security holdings of Pullman Car and Manufacturing Corporation amounting to $11,166,496 and the stock of that corporation are not included in the above stated holdings of the Pullman Company.

During the year a total of 34,356,298 passengers traveled approximately 13,160,000,000 miles and paid $81,240,688. Out of earnings, the company set aside $1,000,000 as a pension reserve and also $1,000,000 as a reserve for excess cost of replacement of cars. The company now has 7,791 cars with a book value of $88,132,981, or $11,312 a car, as compared with 7,665 cars valued at $10,187 in 1923. The income account and balance sheet for the fiscal year ending July 31, 1924, are as follows:

INCOME ACCOUNT

	Year ending July 31, 1924	Year ending July 31, 1923
Gross revenue from cars	$81,240,688	$76,906,665
Operating expenses, repairs of cars, taxes, insurance, etc.	64,550,896	60,553,535
Less:		
Amount paid to railroads as their share of Pullman revenue	8,991,156	8,533,239
Net income from sleeping car business for year	7,698,636	7,919,891
Returns from manufacturing, interest, etc.	7,904,426	5,967,678
Total net income for the year	$15,603,062	$13,887,569
Addition to reserve for depreciation, to complete provision for depreciation on cars in service prior to 1910	.....	670,634
		$13,216,935
Dividends declared, reserve for pensions, reserve for excess cost of replacement of cars	$12,703,221	10,799,852
Net surplus for the year	$2,899,841	$2,417,083

ASSETS

7791 cars and equipment, less reserve for depreciation	$88,132,981	$78,084,091
Repair shops, less reserve for depreciation	4,149,478	4,102,780
Pullman building, less reserve for depreciation	972,644	970,745
Other real estate	1,140	1,140
Operating supplies, linen, etc.	8,743,347	8,137,961
Unexpired insurance	80,103	129,908
Bills and accounts receivable	5,813,631	13,607,904
Equipment trust notes	9,337,689	2,717,199
Marketable securities	4,850,350	4,825,754
Cash, government bonds and certificates of indebtedness	32,618,344	35,230,935
Pullman car and manufacturing corporation, capital stock $50,000,000	36,779,464	36,645,806
Total assets	$191,479,171	$184,454,223

LIABILITIES

Capital stock issued, 1,350,000 shares, par value $100 each	$135,000,000	$135,000,000
Accounts payable	21,146,354	19,026,911
Accrued dividend	2,684,734	2,699,964
Insurance, pension and other reserves	5,960,608	3,939,715
Net surplus	26,687,475	23,787,633
	$191,479,171	$184,454,223

Trade Publications

VALVE GEARS.—In order to facilitate the maintenance of Baker locomotive valve gears, the Pilliod Company, Swanton, Ohio, has issued a 79-page Parts Catalogue. The various types of Baker valve gear are illustrated, and each of the parts entering into their construction is numbered for easy reference when replacing worn or broken members.

POWER SHOVELS.—An addition to the current literature on power shovels has recently been made by the Osgood Company in the form of a bulletin, No. 247, which develops a brief history of the Osgood equipment with a collection of views showing applications of the several types of Osgood equipment from the Osgood No. 73 railroad steam shovel on traction wheels and railroad trucks to the smaller revolving shovels on tractor treads or traction wheels.

FIRST AID TALKS are being conducted among employees of the Chicago, Rock Island & Pacific in Chicago and at Blue Island, Ill., under the direction of Major Shields, field representative of the American Red Cross. The Red Cross has just completed a tour of the Rock Island lines which began last May. The Red Cross surgeons addressed approximately 115,000 persons on the subject of first aid.

Railway Construction

BALTIMORE & OHIO.—This company has awarded to Heyl & Patterson, Inc., New York and Pittsburgh, a contract for a new 10-ton traveling ore bridge to be erected at Lorain, Ohio, to replace one wrecked in the recent tornado.

CHICAGO & NORTH WESTERN.—This company has awarded a contract to Henry Danischefsky, Milwaukee, Wis., for the construction of a passenger station at Waukegan, Ill., reported in the *Railway Age* of August 23.

CHICAGO, BURLINGTON & QUINCY.—This company has begun the construction of extensions to its freight facilities at Denver, Colo., the project including approximately eight miles of additional track, two freight buildings and two loading platforms. The work will cost over $300,000.

COLORADO RIVER LAND COMPANY.—This company has secured concessions for the construction of a new railroad from Calexico, California, to San Felipe Bay, Lower California, a distance of 135 miles. The proposed line will run west from Calexico to Labomba on the coast, then southward parallel to the coast line to San Felipe. J. C. Allison, Calexico, is engineer of the land company.

DENVER & RIO GRANDE WESTERN.—This company, jointly with the Colorado & Southern, plans the construction of a union passenger station at Walsenburg, Colo., to cost approximately $30,000.

FLORIDA EAST COAST.—This company has authorized the construction of 2.6 miles of second track from Lemon City, Fla., to Buena Vista, to cost approximately $105,000, and for 5.48 miles of second track, with yard changes, through West Palm Beach, Fla., to cost approximately $303,000. Bids will be given immediate consideration.

LOS ANGELES & SALT LAKE.—This company has been granted authority by the Railroad Commission of California to proceed with the construction of a new line to Los Angeles Harbor. The new line will replace the present track which runs at grade along Ocean boulevard from the city of Long Beach to the harbor. Plans for the new line provide for the construction of seven separated grade crossings. The new line will be approximately 15 miles long.

MISSOURI PACIFIC.—This company is calling for bids for the remodeling and construction of a 30-ft. addition to its passenger station at Newport, Ark.

PENNSYLVANIA.—This company has awarded a contract to the Dravo Contracting Company, Pittsburgh, Pa., for masonry work for a new bridge over the Ohio river at Steubenville, O., to cost approximately $500,000. A contract has been awarded to the Eyre-Johnston Company, Philadelphia, for the construction of an overhead bridge to eliminate a grade crossing at Slickville, Pa., to cost approximately $50,000. A contract has been awarded to the John F. Casey Company, Pittsburgh, for the reconstruction of an undergrade bridge at Hunker Station, Pa., to cost $20,000.

SAN ANTONIO & MEXICAN.—The Interstate Commerce Commission has issued a certificate authorizing the construction of a line from a point near Three Rivers to a point near Fowlerton, Tex., about 40 miles, but has withheld its approval of a proposed line from Fowlerton to Mirando, Tex., 74.4 miles and of a proposed branch of 55.3 miles to Laredo.

SAN ANTONIO SOUTHERN.—The Interstate Commerce Commission has denied this company's application for a certificate authorizing the construction of an extension from Christine to Rio Grande City or Samfordyce, Tex.

WESTERN MARYLAND.—This company has awarded a contract to the T. J. Foley Company, Pittsburgh, Pa., for the rebuilding of an engine house at Bowest, Pa., which was damaged by fire; estimated cost, $35,000. A bridge over a state highway at Nort Branck, near Cumberland, Md., will be built by the Vang Construction Company, Cumberland, at an approximate cost of $45,000.

Railway Financial News

BOSTON & ALBANY.—*New Directors.*—Allan Forbes, of Dedham, Mass., has been elected a director in place of Robert Gardiner, deceased, and Herbert M. Sears, of Boston, has been elected to succeed Morris Gray, resigned.

CANADIAN NATIONAL.—*New Directors.*—Announcement was made in Ottawa last week of the appointment of five new members to the board of directors of the Canadian National Railways. Three of these were to complete the personnel of the board, as up to date the full complement, as authorized two years ago, had not been appointed. The other two are to fill vacancies. The five appointees are: James G. Gardner of Brockville, Ont.; J. Stuart Rayside of Montreal; Matthew Lodge of Moncton, N. B.; Edward Brown of Winnipeg, to fill the vacancy caused by the resignation of James Stewart of that city; and Robert H. McKay of New Glasgow, N. S., to fill the vacancy caused by the death of John H. Sinclair of that town.

CANADIAN PACIFIC.—*Stock Sold.*—A block of 38,000 shares of Canadian Pacific stock, formerly the property of the German Government and which have been sold by the Canadian Government under authority of the Treaty of Versailles to Hayden, Stone & Co., has been sold to private investors. The underwriting group also included Dominick & Dominick, the Chase Securities Corporation and Blair & Co.

CENTRAL VERMONT.—*Equipment Trusts.*—Plympton, Gardiner & Co. and Paine, Webber & Co. have purchased and will offer shortly $767,000 Central Vermont Railway 5 per cent equipment trust notes, series F, to be dated October 1, 1924, maturing semi-annually April 1, 1925, to October 1, 1932.

COUDERSPORT & PORT ALLEGANY.—*Abandonment.*—This company has applied to the Interstate Commerce Commission for authority to abandon that part of its line from Newfield Junction to Ulysses, Pa., 6.64 miles.

DANVILLE & WESTERN.—*Final Valuation.*—The Interstate Commerce Commission has issued a valuation report, after considering the protest against the tentative valuation, in which the final value of the property owned and used for common carrier purposes, as of June 30, 1916, is found to be $1,913,000.

DENVER & RIO GRANDE WESTERN.—*Foreclosure Sale.*—This company was ordered sold at auction and the upset price fixed at $17,935,700 by Judge J. Foster Symes in the United States District Court in Denver on September 19. The decree and foreclosure provides that the Denver & Rio Grande Western must be sold at auction in not less than 38 days or more than 70 days. Special Master Herrington has set October 29 as the date for the sale. Under the law 10 days must be allowed for redemption of the claims of the company after which the sale will be advertised. Of the price ordered for the road, the court ordered that at least $6,500,000 must be cash to be used to pay off the receiver's certificates. The balance of the purchase price may be in new securities to be issued in exchange for the old bonds on a pro-rata basis. The fee for the master of the auction sale was fixed at $5,000.

T. H. Beacom, receiver of the Denver & Rio Grande Western, has petitioned Federal District Judge Symes for permission to pay October 1 interest on Rio Grande Western first consolidated mortgage bonds due that date and amounting to $301,620. The court will rule on the application at a later date.

FLORIDA EAST COAST.—*Six Months' Guaranty.*—The Interstate Commerce Commission has issued a final certificate fixing the amount of this company's guaranty for the six months' period following the termination of federal control at $694,150.

Securities.—The Interstate Commerce Commission has authorized an issue of $25,000,000 of capital stock to be delivered upon surrender and cancellation of a like amount of general mortgage income 5 per cent. bonds; also the issue of $15,000,000 of first and refunding mortgage 5 per cent bonds to be sold at not less than 92.

MINNEAPOLIS & ST. LOUIS.—*Rehabilitation Plan.*—W. H. Bremner, receiver for this company, has filed with Federal Judge Wilbur

F. Booth at Minneapolis, details of a rehabilitation plan in which issuance of $7,000,000 of receiver's certificates is asked. The full plan contemplates the expenditure of $13,735,000 by January 1, 1927, including an equipment program that calls for the purchase of 20 locomotives, 10 passenger coaches, 100 refrigerator cars, 500 gondolas, 200 flat cars, 1,000 box cars and several motor coaches, at an estimated cost of $5,380,000. It is proposed to finance the improvements by the issuance of equipment trusts of 15 year tenure.

PARIS-LYONS-MEDITERRANEAN.—*Notes.*—The Seaboard National Bank, New York, heading a group of New York, Philadelphia and Boston banking houses, has purchased in the last few weeks about $2,200,000 six months collateral notes of the Paris-Lyons-Mediterranean, on a 5¼ per cent basis.

These notes are secured by deposit of ten-year notes of the railroad, which notes are quoted on the Paris Stock Exchange at 94½ per cent of the face value, and the interest and sinking fund of which are guaranteed by the French government in a similar manner as the Paris-Orleans bonds recently placed in this market. The Paris, Lyons & Mediterranean has agreed to maintain a margin of 10 per cent on the market value of the collateral. The railroad in the past has financed its current needs mostly by short-term notes contracted in the London market; but of late, by reason of the somewhat lower interest rates obtained here, this business has been partially transferred to New York. This line connects Paris with Lyons, Nice, Monte Carlo and Geneva.

SOUTHERN RAILWAY.—*Equipment Trusts Sold.*—Drexel & Co., Philadelphia, have sold at prices to yield 4 per cent to 4.80 per cent $7,050,000 4½ per cent equipment trust gold certificates, series Z.

SPOKANE & EASTERN RAILWAY & POWER COMPANY.—*Compensation for Federal Control Period.*—A board of referees appointed by the Interstate Commerce Commission has reported that this company and the Inland Empire Railroad Company have failed to show any right or title to claim compensation from the government on account of the federal use and control of the property of the Spokane & Inland Empire, which they had acquired through foreclosure proceedings.

TEXAS & PACIFIC.—*Notes.*—The Interstate Commerce Commission has authorized an issue of $4,400,000 of 6 per cent secured gold notes and the pledge of $5,500,000 of general and refunding mortgage gold bonds as collateral therefor.

WEST JERSEY & SEASHORE.—*Tentative Valuation.*—The Interstate Commerce Commission has served a tentative valuation as of June 30, 1916 in which the final value for rate-making purposes of the common carrier property owned and used is placed at $26,471,300. This considerably exceeds the outstanding capitalization as of valuation date, which was $17,467,605, or the investment in road and equipment, which was stated in the books as $21,302,870 but which the report readjusts to $20,759,273. The cost of reproduction new is reported as $26,194,938 and the cost of reproduction less depreciation as $19,677,964. The 4,008 acres of carrier lands are given a present value of $5,593,502.

WINSTON-SALEM TERMINAL COMPANY.—*Bonds.*—Clark, Dodge & Co. are offering $800,000 first mortgage 5 per cent bonds, due April 1, 1966, at 100 and accrued interest. The issue is unconditionally guaranteed both as to principal and interest, jointly and severally, by the Norfolk & Western, the Southern Railway and the Winston-Salem Southbound Railway by endorsement. The stock of the terminal company is owned one-third each by the three guarantor railway companies, the aggregate net income of which for the year ended December 31, 1923, after deducting all operating expenses and fixed charges, was in excess of $33,000,000.

Dividends Declared

Gulf, Mobile & Northern.—Preferred, 1¼ per cent, quarterly, payable November 15 to holders of record November 1.

Kansas City Southern.—Preferred, 1 per cent, quarterly, payable October 15 to holders of record September 30.

Reading Company.—Common, 2 per cent, quarterly, payable November 13 to holders of record October 20. Second preferred, 1 per cent, quarterly, payable October 9 to holders of record September 23.

Trend of Railway Stock and Bond Prices

	Sept. 23	Last Week	Last Year
Average price of 20 representative railway stocks	71.00	70.45	59.46
Average price of 20 representative railway bonds	88.46	87.86	81.98

Railway Officers

Executive

W. C. Hilton, contracting agent of the Atchison, Topeka & Santa Fe, with headquarters at Chicago, has been promoted to assistant to the vice-president in charge of operation, with the same headquarters, a newly created position.

Lewis J. Spence, director of traffic of the Southern Pacific, with headquarters at New York, has also been elected executive officer of the Southern Pacific steamship lines, having general control and direction of all departments and operations of the steamship lines of the company. Mr. Spence entered railway service in 1885 as a stenographer in the traffic department of the Southern Pacific and was subsequently promoted to secretary and chief clerk to the assistant general traffic manager of the same company. He was appointed eastern freight agent on January 1, 1896, and held that position until March 1, 1902, when he was promoted to general eastern freight agent at New York. He was also appointed general freight agent of the Atlantic Steamship Lines in 1906, and in January, 1911, he was appointed assistant director of traffic of the Southern Pacific at Chicago. A year later Mr. Spence was appointed director of traffic of the Southern Pacific and the Union Pacific at New York. At the dissolution of the Southern Pacific Union Pacific merger in 1913, he became director of traffic of the Southern Pacific, in which capacity he is also serving at the present time. Mr. Spence is also a member of the board of directors of the Southern Pacific Company.

L. J. Spence

Operating

W. L. Baker, trainmaster of the Florida East Coast, has been appointed assistant superintendent of transportation, with headquarters at Miami, Fla. **F. L. Horton,** chief dispatcher, has been appointed trainmaster, with headquarters at Miami, succeeding Mr. Baker. **J. S. Houston,** train dispatcher, has been appointed chief dispatcher, also with headquarters at Miami, succeeding Mr. Horton; all effective October 1.

Traffic

G. D. Jackson has been appointed commercial agent for the Louisiana & Arkansas, with headquarters at Detroit, Mich., succeeding J. S. Kellie, deceased.

The headquarters of **E. F. Feeney,** division freight agent of the Chicago, Rock Island & Pacific, have been transferred from Alexandria, La., to El Dorado, Ark.

C. C. Clabaugh, city passenger agent of the Missouri-Kansas-Texas, with headquarters at Pittsburgh, Pa., has been promoted to district passenger agent, with the same headquarters.

W. T. Stupp, traveling freight agent of the Michigan Central, with headquarters at Philadelphia, Pa., has been promoted to general agent, with headquarters at Toledo, Ohio, succeeding N. J. Brennan, whose promotion to division freight

agent, with headquarters at Detroit, Mich., was reported in the *Railway Age* of September 20.

E. W. Brunck, whose promotion to general freight agent of the Michigan Central, with headquarters at Detroit, was reported in the *Railway Age* of September 20, was born on January 16, 1883, at Lancaster, N. Y. He entered railway service on June 1, 1900, as a stenographer and clerk in the local freight office of the New York Central & Hudson River, now a part of the New York Central, at Buffalo, N. Y. On July 25, 1902, he was transferred to the office of the division freight agent at Buffalo, and on January 1, 1908, was promoted to secretary and chief clerk to the manager of the New York Central fast freight lines. Mr. Brunck was promoted to chief clerk to the general freight agent of the Michigan Central at Detroit in November, 1917, and held this position until September 15, 1919, when he was promoted to assistant general freight agent. He remained in that position until his recent promotion to general freight agent.

James Finlay, whose promotion to assistant general freight agent of the Michigan Central, with headquarters at Detroit, Mich., was reported in the *Railway Age* of September 20, was born on August 26, 1873, at Hamilton, Ont. After graduating from the Collegiate Institute at Stratford, Ont., in 1886, he entered railway service as office boy in the office of the division superintendent of the Grand Trunk at Battle Creek, Mich. He was promoted to stenographer in November, 1887, and held that position until February, 1893, when he was appointed stenographer in the office of the Merchants Dispatch Transit Company, operated by the New York Central, at Chicago. Mr. Finlay was promoted to agent at Grand Rapids, Mich., in January, 1904, and in November, 1907, was promoted to traveling freight agent of the Michigan Central, with headquarters at Detroit. He was promoted to commercial agent at Battle Creek, Mich., in September, 1917, and on October 1, 1920, was promoted to division freight agent, with headquarters at Detroit. Mr. Finlay remained in the latter position until his recent promotion to assistant general freight agent.

O. R. Bromley, whose promotion to freight traffic manager of the Michigan Central, with headquarters at Detroit, was reported in the *Railway Age* of September 20, was born on August 22, 1884, at Detroit, Mich. He entered railway service on May 1, 1900, in the office of the freight claim agent of the Michigan Central and later was promoted to junior clerk. He was appointed local agent of the Detroit United Railway in April, 1902, and held this position until November, 1905, when he returned to the freight office of the Michigan Central at Detroit. Mr. Bromley was appointed chief percentage clerk of the Ann Arbor in April, 1908, but in November of that year again returned to the Michigan Central as percentage clerk in the tariff bureau. He was promoted to chief percentage clerk in June, 1909, and in January of the following year was promoted to chief clerk of the tariff bureau. Mr. Bromley was promoted to chief clerk to the general freight agent in August, 1910, and held this position until June, 1915, when he was promoted to division freight agent at Grand Rapids, Mich. He was promoted to assistant general freight agent, with headquarters at Detroit, in June, 1918, and in March, 1920, was promoted to general freight agent. He remained in that position until his recent promotion to freight traffic manager.

Engineering, Maintenance of Way and Signaling

John Foley, forester of the Pennsylvania system, Philadelphia, Pa., has been appointed chairman of the Consulting Committee on the Standardization of Hard Woods under the Central Committee on Lumber Standardization.

Mechanical

E. Gelzer, mechanical engineer of the Chicago Great Western, with headquarters at Oelwein, Iowa, has resigned.

H. P. Allstrand, master mechanic on the Chicago & North Western, with headquarters at Boone, Iowa, has been promoted to general supervisor of efficiency, with headquarters at Chicago, a newly created position. **W. H. Halsey,** master mechanic, with headquarters at Belle Plaine, Iowa, has been transferred to Boone, succeeding Mr. Allstrand.

Purchasing and Stores

J. J. Fogarty, division storekeeper on the Missouri Pacific, with headquarters at Kansas City, Mo., has been promoted to district storekeeper, with headquarters at DeSoto, Mo., succeeding **J. E. Bogan,** who has been appointed division storekeeper at Nevada, Mo. **L. L. Studer,** division storekeeper, with headquarters at Osawatomie, Kans., has been transferred to Kansas City, succeeding Mr. Fogarty. **C. W. Krumm,** division storekeeper, with headquarters at Coffeyville, Kans., has been transferred to Osawatomie, succeeding Mr. Studer. **W. O. McClellan** has been appointed division storekeeper at Coffeyville, succeeding Mr. Krumm.

Obituary

William Garstang, who retired as general master car builder of the Cleveland, Cincinnati, Chicago & St. Louis and the Peoria & Eastern in December, 1913, and who for the past several years has represented the Gould Coupler Company at Indianapolis, Ind., died in Indianapolis on September 12. Mr. Garstang at the time of his retirement had been in active railway service for 50 years in the mechanical department and had been connected with the Master Car Builders' Association and the Master Mechanics' Association for about 35 years. In 1894 and 1895 he was president of the Master Mechanics' Association. He served on the committees that adopted the M. C. B. standard car axle, journal box, journal brass, journal wedge and standard wheels. He had also served for many years as chairman of the committee on standard wheels. He designed and contracted for the Cleveland, Cincinnati, Chicago & St. Louis shops at Beech Grove, Ind., and the work was carried out under his supervision, in addition to his other duties. Mr. Garstang was born on February 28, 1851, in England and was educated in the public schools. In 1862 he was a water carrier for the contractors on the laying of track from Fort Erie to Niagara and in December, 1863, entered railway service as a machinist's apprentice at Cleveland, Ohio, where he remained six years, on the Cleveland & Erie, which later became part of the Lake Shore & Michigan Southern. During this time he went to night school and studied mathematics and mechanical drawing. He subsequently served consecutively for 11 years as machinist and general foreman of the Atlantic & Great Western and the New York, Pennsylvania & Ohio; for three years as general foreman of the Cleveland & Pittsburgh division of the Pennsylvania; for five years as master mechanic of the Cleveland, Columbus, Cincinnati & Indianapolis which later became the Cleveland, Cincinnati, Chicago & St. Louis; and in 1888 he was appointed superintendent of motive power of the Chesapeake & Ohio. In April, 1893, he was appointed superintendent of motive power of the Cleveland, Cincinnati, Chicago & St. Louis, remaining in that position until February, 1913, when he was relieved of a portion of his duties and served mainly in an advisory capacity, with the title of general master car builder, until his retirement in the following December. During his long railway service he had been closely identified with the progress made in railroading.

W. Garstang